



SRM
UNIVERSITY AP
Amaravati

SYLLABUS

DEPARTMENT OF MECHANICAL ENGINEERING

SEMESTER 02

02

SEMESTER

22

CREDITS

06

SUBJECTS

OVERVIEW

Our mechanical engineering department will address the world's chief concern of energy efficiency and alternate resources. We will push forward to identify and utilize new and renewable power sources for a greener and cleaner world.



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**Department of Mechanical Engineering
SRM University-AP**

Semester – II

| SUBJECT CODE | SUBJECT TITLE | CORE/ ELECTIVE | CREDITS | | | |
|--------------|---------------|-------------------|---------|---|---|---|
| | | | L | T | P | C |
| EGL 101 | English | C | 3 | 0 | 0 | 3 |

Course description:

This course is designed to help students increase writing and verbal English skills with regular practice and analysis of effective writing. This course will cover English in social, business, scientific and professional situations as well as public speaking.

Unit I (9 hours)

Horizontal and Vertical Writing – Students learn the differences between Vertical and Horizontal Writing. Readings from the best writers illustrate the best English writing.

Unit II (9 hours)

Basic English Concepts and Introduction to Linguistics – Students learn by the practice of working on basic English concepts of writing and speaking.

Unit III (9 hours)

Creative Writing – Learning to express ideas in ways that persuasively and clearly help the readers/listeners understand the student’s experiences.

Unit IV (9 hours)

Research Writing – The basics of how to write a research paper. Most students were (shockingly) never required to do a bibliography. They learn about thesis paragraphs, research, outlines, rewriting, editing and creating a bibliography.

Unit V (9 hours)

English Presentations – In this Unit, students learn to combine and synthesize their writing with presentation skills. Research papers and ideas are shared and presented to small and large groups.

Text Books:

1. Communicative English – (A workbook) Cambridge University Press
2. Streets of Laredo by Larry McMurty (A novel), Simon and Schuster, 2010

References:

1. Oxford English Language Dictionary

Semester – II

| SUBJECT CODE | SUBJECT TITLE | CORE/ ELECTIVE | CREDITS | | | |
|--------------|-------------------|-------------------|---------|---|---|---|
| | | | L | T | P | C |
| ENG111 | Basic Electronics | C | 3 | 0 | 2 | 4 |

Course Description

This course is designed to give basic understanding of basic principles of electronics/concepts and devices to all engineering students

Unit I

ELECTRICAL QUANTITIES AND THEIR MEASUREMENT

(9 hours)

Ohm's law, permanent magnet moving coil (PMMC) instrument, Ammeter and Voltmeter using PMMC, Measurement of resistance using Wheat Stone's Bridge and Kelvin's double bridge, measurement of capacitance using Schering's bridge and De Sautee's bridge, and measurement of inductance using Maxwell's bridge and Hay's bridge. Operation of the oscilloscope.

Unit II

SEMICONDUCTOR DEVICES

(9 hours)

Forward and reverse bias characteristics of PN junction diode. Design of half-wave, full-wave, bridge rectifiers, clipping and clamping using PN junction diode. Bipolar junction transistors (BJTs), common-base, common-collector and common-emitter configurations using BJTs. Voltage and current gain, transistor as amplifier and buffer. Photodiode and phototransistor.

Unit III

A.C. CIRCUITS AND OPERATIONAL AMPLIFIER

(9 hours)

Phasor analysis, impedance and reactance, resonance, tuned circuits using R-L-C components, series reactance and resistance, parallel reactance and resistance. Characteristics of an operational amplifier, inverting and non-inverting op-amps, integrator and differentiator design using op-amp. Differential operational amplifier and common-mode rejection ratio.

Unit IV

ELECTRONIC FILTERS

(9 hours)

Low and high frequency noise in electronic circuits, basic low-pass, high-pass, band-pass and band-reject passive filters design using resistor, capacitor and inductor. Fourier transform, magnitude and phase response, bandwidth, bode plots. Design and analysis of higher order filters. Active filter design using operational amplifier, applications of electronic filters.

Unit V

DIGITAL LOGIC FUNDAMENTALS

(9 hours)

Number systems: binary, decimal, octal and hexadecimal number systems, number system conversions. Logic gates: AND, OR, NOT, NAND, NOR, X-OR, X-NOR. Logic gates design using PN diodes. De Morgan's laws, Karnaugh maps. Basic combinational logic blocks: half adder, half subtractor, full adder, full subtractor, multiplexer and de multiplexer.

Lab Work:

Based on theory, some basic experiments will be conducted

(30 hours)

Text books:

1. Principles of electronics by V K Mehta & Rohit Mehta, 2010 edition, S Chand and Co.Publisher, ISBN: 9788121924504.
2. Electronic devices and circuits by David A. Bell, 2008 edition, Oxford University Press, ISBN: 9780195693409.
3. Introduction to digital logic design by John P. Hayes, 1993 edition, Pearson Edition, ISBN: 9780201154610.

References:

1. Electronic measurements and Instrumentation by A K Sawhney, 2015 edition, Dhanpat Rai and Co., ISBN: 9788177001006.
2. Pulse, Digital and Switching waveforms by Mill man and Taube, 2011 edition, Tata McGraw Hill, ISBN: 9780071072724.

Semester – II

| SUBJECT CODE | SUBJECT TITLE | CORE/ ELECTIVE | CREDITS | | | |
|--------------|----------------------|----------------|---------|---|---|---|
| | | | L | T | P | C |
| ENG 105 | Engineering Graphics | C | 2 | 0 | 2 | 3 |

Course description

The course provides the fundamentals of engineering drawing. Topics include: orthographic projection, dimensioning, sectioning, and isometric, perspective projection, free hand sketching and introduction to CAD design software (Solid works).

Unit I

Introduction

(2 hours)

Importance of graphics in engineering applications, Drawing instruments and accessories, BIS code of practice for general engineering drawing, Drawing sheet layouts, Folding of drawing sheets, Lettering and dimensioning, Scales.

Orthographic Projection of Points, Lines, Plane surfaces and Solids

(14 hours)

Projection of points, Projection of straight lines inclined to one of the reference planes, Projection of straight lines inclined to both the principal planes, True length and inclination of lines with reference planes, Projection of planes inclined to both the principal planes. Projection of simple solids with axis inclined to one of the reference planes, Projection of simple solids with axis inclined to both the reference planes. CAD Exercises

Unit II

Sections and Development

(5 hours)

Sections of simple solids in simple vertical positions with section plane inclined to one of the reference planes- Obtaining true shape of the section. Development of surfaces of simple and sectioned solids. CAD Exercises

Unit III

Isometric and perspective projection

(6 hours)

Isometric projection of simple solids and truncated solids, Conversion of isometric views to orthographic views and vice versa. Perspective projection of simple solids. CAD Exercises

Unit IV

Geometric Dimensioning and Tolerancing

(3 hours)

GD&T-rules & concepts, Geometric characteristics, Geometric modifiers, Datums and datum reference, Feature control frame. CAD Exercises.

Unit V

Free hand sketching and CAD

(30 hours)

Free hand sketching of real objects, Free hand sketching of multiple views from pictorial Views. CAD-SolidWorks- Creation of 2D drawings, Solid modeling, Sectioning of solids, Assembly drawings, Exploded views, Creation of technical drawings.

Lab Work:

1. Assignment on 2-D sketching with geometrical and dimensional constraints
2. Assignment on parametric solid modeling of a machine component
3. Assignment on solid modeling of the parts of a machine (min. 5 components)
4. Assignment on assembly modeling of the parts modeled in assignment 3 using proper mating conditions and generation of exploded view
5. Generation of production drawings of the parts and assembly with appropriate tolerance

Text books:

1. Bhatt, N.D, Engineering Drawing, Charotar Publishers, 2014
2. Bhatt, N.D, Machine Drawing, Charotar Publishers, 2014

Reference books:

1. Venugopal, K. and Prabhu Raja, V., Engineering Graphics, Eighth Edition (Revised), New Age International Publishers, Chennai, 2007.
2. Narayanan, K. L. and Kannaiah, P., Engineering Graphics, Scitech Publications, Chennai, 1999.
3. Shah, M. B. and Rana, B. C., Engineering Drawing, Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2005, Mc Graw-Hill, 2010
4. Alex Krulikowski, Fundamentals of Geometric Dimensioning and Tolerancing, Cengage Learning, 2012.

Semester – II

| SUBJECT CODE | SUBJECT TITLE | CORE/ELECTIVE | CREDITS | | | |
|--------------|------------------------------|---------------|---------|---|---|---|
| | | | L | T | P | C |
| ME103 | Mechanical Engineering Tools | C | 0 | 0 | 2 | 1 |

Course description

This course is designed to teach students about function and operation of all the machines that are typically present in engineering workshop, with hands-on training. Course will ensure each student

Works on some exercises to be executed using machines in the workshop

Unit I

Lathe (10 hours)

Basic constructional features, working principle and applications. Lathe tool bits- Introduction, classification and geometry. Step turning, taper turning, chamfering, eccentric turning, right hand threading and knurling operations. CNC lathe.

Unit II

Manual and CNC Milling (8 hours)

Basic constructional features, working principle and applications. Gear- Introduction and classification. Spur gear and helical gear cutting using milling machine.

Shaping, Slotting and Drilling (2 hours)

Basic constructional features, working principle and applications. Simple shaping and slotting exercises. Drilling, boring and reaming operations using radial drilling machine.

Unit III

Grinding (2 hours)

Basic constructional features, working principle and applications. Cylindrical and plain surface grinding operations. Grinding of tool angles. Analysis of generated surfaces using a surface profile meter.

Welding and Laser Cutting (2 hours)

Working principle, types, and methods. Welding and simple laser cutting exercises (Demonstration only).

Unit IV

Foundry/Smithy/Carpentry/Fitting/Plumbing/Power tools **(2 hours)**

Unit V

Introduction to MAT LAB **(4 hours)**

Simple engineering program (for example matrix operations) exercises in Mat lab

Text books:

1. Gopal, T.V., Kumar, T., and Murali, G., A first course on workshop practice –Theory, Practice and Work Book, Suma Publications, Chennai, 2005.
2. Kannaiah.P., and Narayanan, K. C., Manual on Workshop Practice, SciTech Publications, Chennai, 1999.
3. Venkatachalapathy, V. S., First year Engineering Workshop Practice, Ramalinga Publications, Madurai, 1999.

Reference books:

1. Ernie Conover, The Lathe Book: A Complete Guide to the Machine and Its Accessories, Taunton Press, 2001.
2. Peter Smid, A Comprehensive Guide to Practical CNC Programming, Industrial press Inc., 2008.
3. Larry Jeffus, Welding: Principles and Applications, Engage Learning, 2016.
4. Chapman, Workshop Technology, Part 3, CBS Publication
5. RK Rajput, Manufacturing Technology, 2nd edition, LP Publication

Semester – II

| SUBJECT CODE | SUBJECT TITLE | CORE/ ELECTIVE | CREDITS | | | |
|--------------|-----------------------------------|----------------|---------|---|---|---|
| | | | L | T | P | C |
| PHY111 | Introduction to Classic Mechanics | C | 3 | 0 | 2 | 4 |

Course description

The course aims to cover the fundamental formalism and applications of classical mechanics. It mainly includes basic Newtonian mechanics and special theory of relativity.

Unit – I

Review of Newtonian Mechanics

(6 hours)

Review of Scalars, Vectors and Kinematics, Newton's Laws of Motion and applications, Contact Forces, Static Friction, worked examples, Tension and springs, Pushing Pulling and Tension, Solving Pulley Systems, Hooke's Law and applications.

Unit – II

Circular Motion

(6 hours)

Polar Coordinates, Position and Velocity Vectors, Angular Velocity, Uniform Circular Motion, Direction of the Acceleration, Period and Frequency, Angular Acceleration, Newton's Second law and circular motion, worked examples

Unit –III

Momentum and Impulse

(6 hours)

Momentum and Impulse, Impulse momentum theorem, Conservation of Momentum, Momentum Diagrams, worked examples, Center of Mass and Motion of the Center of Mass, Center of Mass of 3 Objects, Center of Mass of a Continuous System, Center of Mass of a Uniform Rod and different objects, Velocity and Acceleration of the Center of Mass, Reduction of a System to a Point Particle, Center of Mass Trajectory.

Unit-IV

Work Energy and Collision

(8 hours)

Kinetic Energy and Work in 1D, Work by a Constant Force, Work by a Non- Constant Force, Work-Kinetic Energy Theorem and related problems, Kinetic Energy and Work in 2D and 3D, Work-Kinetic Energy Theorem in 2D and 3D, Worked Example, Conservative and Non- conservative Forces, Path Independence - Gravity, Path Dependence – Friction, Potential Energy due to gravity and of a spring, worked examples, Principle of energy conservation and worked examples, Collision and its type. Collision in 1D and worked examples
Collision in 2D and worked examples

Rotational Motion: (6 hours)

Motion of a rigid body and moment of inertia, Parallel and perpendicular axis theorem, Moment of inertia of different objects, Torque and Angular momentum, worked examples

**Unit-V
Gravitation : (6 hours)**

Central forces, Newton's Law of Gravitation, Principle of Superposition, Acceleration due to gravity and its variation, Gravitational Potential Energy, Kepler's Laws, hyperbolic and parabolic orbits, Satellites' Orbits and Energy, worked examples

Special Theory of Relativity : (6 hours)

Michelson-Morley experiment, Postulates of special theory of relativity, Galilean and Lorentz transformations, Relative Velocity, Velocity in ground frame and moving frame. Length contraction and time dilation, Worked examples, Relativistic addition of velocities, Mass energy and Energy-momentum relation.

Book(s) of Study:

1. MIT-- 8.01X online course material
2. University Physics with Modern Physics with Mastering Physics, (12th Edition) - Hugh D.Young, Roger A. Freedman and Lewis Ford (Publisher – Pearson Education)
3. Introduction to Classical Mechanics - R. G. Takwale, P. S. Puranik (Publisher - Tata McGraw-Hill Education)

Book(s) of Reference:

1. Classical Mechanics (2011) - Herbert Goldstein (Publisher – Pearson Education)
2. Classical Mechanics (2014) - J. C Upadhayaya (Publisher – Himalaya Publishing House)

Course Laboratory: (30 hours)

List of proposed experiments

| S:No | Experiment name |
|------|--|
| 1 | Determination of Young's modulus of the material |
| 2 | Determination of rigidity modulus of the material - torsion pendulum |
| 3 | Forced Oscillators & Resonance |

| | |
|----|--|
| 4 | Damping Oscillation In Various Medium |
| 5 | Specific Heat of Solids |
| 6 | Measurement of Joule`s Constant (by electrical method) |
| 7 | Verification of Stefan`s Law |
| 8 | Thermal and Electrical Conductivity of Metals |
| 9 | Franck Hertz Experiment |
| 10 | Balmer Series and Rydberg`s Constant |

Semester – II

| SUBJECT CODE | SUBJECT TITLE | CORE/ ELECTIVE | CREDITS | | | |
|--------------|--------------------------|-------------------|---------|---|---|---|
| | | | L | T | P | C |
| MAT 111 | Single Variable Calculus | C | 3 | 2 | 0 | 4 |

Course description

This course is an introduction to Single Variable Calculus to all engineering students. The objective is to equip the students with the knowledge of calculus and its applications

Unit I – Derivatives and Differentiation (21 hours)

Limit, Continuity and limits of quotients, Derivatives and its geometrical Interpretation, Derivative as a function and calculating derivative, Leibnitz notation and higher derivatives, Trigonometric functions, Linear Approximations, Product and quotient rules, Chain rule, Implicit differentiation, Inverse, exponential and logarithm functions.

Unit II- Approximations and their Applications (11 hours)

Measurement error of linear approximation, Quadratic approximation, Newton's method, 1 and 2nd derivative test, Limits and asymptotic, Max min problems, Related application in real-life problems.

Unit III – The Integral and Integration Theory (12 hours)

Mean Value Theorem, Differentials and anti-derivatives, Differential equations, The definite integral, First and Second Fundamental Theorem of Calculus.

Unit IV – Different Integration Techniques and Application of Calculus (15 hours)

Areas and Volumes, Average value, Probability, Numerical Integration, Integrals of Trigonometric Power, Trigonometric substitution, Partial fractions, Integration by Parts, Arc length and Surface area.

Unit V – Polar Co-ordinate systems and Infinite Series (16 hours)

Parametric curves, Polar co-ordinates, L'Hospital's rule, Improper Integrals, Infinite Series, Taylor's series.

Books of Study:

1. R. G. Bartle and D. R. Sherbert, Introduction to Real Analysis, Third edition, Wiley India , 2005.
2. S. R. Ghorpade and B. V. Limaye, An Introduction to Calculus and Real Analysis, Springer India, 2007.
3. Michael Spivak, Calculus, Third Edition, Cambridge University, 2008.

Books of Reference:

1. G. B. Thomas, Jr. and R. L. Finney, Calculus and Analytic Geometry, 3rd Ed., Pearson Education India 9th Edition 1999
2. P.M. Fitzpatrick, Advanced Calculus, 2nd Edition, AMS Indian Edition, 2010.

Semester – II

| SUBJECT CODE | SUBJECT TITLE | CORE/ ELECTIVE | CREDITS | | | |
|--------------|---------------|----------------|---------|---|---|---|
| | | | L | T | P | C |
| ECO 221 | Economics | C | 3 | 0 | 0 | 3 |

Course Description:

The course will talk about e-commerce—since we observe in today’s world that a real market where producers and consumers interact are becoming less common. This course will provide a broad overview of the economic theory and empirical analysis in the area of e-commerce.

UNIT I. Introduction (7 hours)

Relevance and potential of E-Commerce in India (Lecture notes)
 E-commerce and its relevance to labour, credit and health care markets (Lecture notes)

UNIT II. Background Concepts (12 hours)

Perfect competition: Meaning, revenue of a competitive firm, Profit maximization and firms supply curve

Monopolistic competition and product differentiation

Competition with differentiated products. (Mankiw, chapters 14, 15 and 16). Monopoly pricing and price discrimination, Meaning, monopolies production and pricing decisions, price discrimination, advertisement.(PRN Sections 3.1, 3.2, 4.1) (SV Chapters 2, 3)

Competition and oligopoly pricing, Cost of producing information. Cost and competition, market structure for information goods, pricing your product. (Shapiro and Varian, Chapter 2)

Market leadership

Network and positive feedback, demand side economies of scale, network externalities, collective switching costs, Generic strategies in network markets (Shapiro and Varian, Chapters 5, 7), PRN Section 12.4, Time Paths in the Diffusion of Product Innovations

UNIT III. Select E-Industries (10 hours)

Auctions:

Why are some goods auctioned and others sold at fixed prices?

Different auction platforms and what explains success of some platforms and failures of other platforms. Changes in business of auctions over the past two decades. Required websurfing: eBay, Yahoo!, Auctions on the Internet: What's Being Auctioned and How, Vickrey auctions in practice: From Nineteenth Century Philately to Twenty-First Century E-commerce, Trust Among Strangers in Internet Transactions: Empirical Analysis of eBay’s Reputation System

Retail stores

How does the internet affect retail markets? Comparison of these markets with the traditional markets in terms of search costs and patterns of competition, Required

websurfing: Amazon, Dell, Pcboost, Z-shops, Yahoo! Shopping, Autobytel, & Wal-mart, Emerging Landscape for Retail E-Commerce

UNIT IV. Introduction to Statistics and Econometrics

(7 hours)

Definition of basic statistical concepts: mean, median, probability, conditional expectation, conditional probability (Lecture notes), Introduction to regression analysis (Lecture notes), Statistical Models and Shoe Leather

UNIT V. Sales Taxes and E-Commerce

(14 hours)

The effect of sales taxes on the development e-commerce, Demand and supply effects of sales taxes, Sales taxes and internet commerce, iTax Sensitivity and Home State Preferences in Internet Purchasing, In a World without Borders: the Impact of Taxes on Internet Commerce, Playing with Fire: Cigarettes, Taxes and Competition from the Internet, iTaxation of Electronic Commerce

Books of study

1. Industrial Organization: Contemporary Theory and Practice by Pepall, Richards and Norman [PRN].
2. Information Rules by Shapiro and Varian [SV]
3. Principles of microeconomics, N. Gregory Mankiw, Publisher: Cengage Learning fifth edition.

Books of reference

1. Intermediate Microeconomics: A Modern Approach, Hal R. Varian, Affiliated East-West Press Pvt. Ltd., eighth edition
2. Electronic Commerce (Fourth Edition), Adesh k. Pandey : Pete Loshin
3. E-Business and E-Commerce Management, Dave Chaffey, 3rd Edition, 2009, Pearson Education Inc., New Delhi
4. E-Commerce fundamentals and Applications, Chan, Wiley India, New Delhi

Semester – II

| SUBJECT CODE | SUBJECT TITLE | CORE/ ELECTIVE | CREDITS | | | |
|--------------|---------------|----------------|---------|---|---|---|
| | | | L | T | P | C |
| CDC 1002 | Soft Skills | C | 1 | 0 | 1 | 1 |

UNIT I - INTERPERSONAL SKILLS

(6 hours)

Understanding the relationship between Leadership Networking & Team work, Realizing Ones Skills in Leadership, Networking & Team Work, and Assessing Interpersonal Skills Situation description of Interpersonal Skill.

Team Work

Necessity of Team Work Personally, Socially and Educationally

UNIT II - LEADERSHIP

(4 hours)

Skills for a good Leader, Assessment of Leadership Skills

Change Management

Exploring Challenges, Risking Comfort Zone, Managing Change

UNIT III - STRESS MANAGEMENT

(6 hours)

Causes of Stress and its impact, how to manage & distress, Understanding the circle of control, Stress Busters.

Emotional Intelligence

What is Emotional Intelligence, emotional quotient why Emotional Intelligence matters, Emotion Scales. Managing Emotions.

UNIT IV - CONFLICT RESOLUTION

(4 hours)

Conflicts in Human Relations – Reasons Case Studies, Approaches to conflict resolution.

UNIT V - DECISION MAKING

(10 hours)

Importance and necessity of Decision Making, process of Decision Making, Practical way of Decision Making, Weighing Positives & Negatives.

Presentation

Reference Books:

1. Covey Sean, Seven Habit of Highly Effective Teens, New York, Fireside Publishers, 1998.
2. Carnegie Dale, How to win Friends and Influence People, New York: Simon & Schuster, 1998.
3. Thomas A Harris, I am ok, You are ok , New York-Harper and Row, 1972
4. Daniel Coleman, Emotional Intelligence, Bantam Book, 2006