F.Y. Mechanical Sem-I Syllabus w.e.f. 2026-27

Walchand College of Engineering, Sangli
(Government Aided Autonomous Institute)

AY 2026-27 onwards

Course Information	
Programme	B.Tech.
Class, Semester	First Year (Mechanical), Semester I
Course Code	8BS105
Course Name	Linear Algebra and Calculus (ME)
Desired Requisites:	Mathematics course at Higher Secondary Level

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**MSE**	**ESE**	**ISE**	**Total**
Tutorial	1 Hrs/week	30	50	20	100

Credits: 03

Course Objectives	
1	To introduce matrix theories and systems of algebraic equations.
2	To present the principles of partial derivatives and optimization.
3	To detail the fundamentals of vector differentiation and integration.
4	To cover the concepts of multiple and improper integrals.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statements**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Descriptor**
CO1	**Understand** the physical significance of divergence, curl, and improper integrals.	II	Understanding
CO2	**Apply** Gauss elimination to solve complex systems of linear equations.	III	Applying
CO3	**Apply** partial differentiation to calculate errors, approximations, and extreme values.	III	Applying
CO4	**Apply** multiple integration techniques to solve Engineering Problems**.**	III	Applying

Module	**Module Contents**	**Hours**
I	**Linear Algebra** Matrices and Rank, system of Linear equations, Gauss elimination method, Eigen value and Eigen vector, Cayley Hamilton Theorem.	5
II	**Differential Calculus** Partial derivative, error and approximations, maxima and minima, Mean value theorems.	4
III	**Vector Differentiation** Velocity, acceleration, directional derivative, gradient, divergence, Curl of vector function.	5
IV	**Integral Calculus** Introduction, Improper integral, Gamma function and its properties, Beta function and its properties.	5

V	**Multiple Integral** Double integral, triple integral, Change the order of integration, integration over the area.	4
VI	**Vector Integration** Work done, Line integral, surface integral, Green's theorem, Stoke's theorem, Gauss divergence Theorem.	5

Textbooks	
1	B. V. Ramana, Higher Engineering Mathematics, The McGraw Hill companies, 2006.
2	H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., 1st Edition, 2014.
3	Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition

References	
1	Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, Inc., 10th Edition, 2015.
2	R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing House, 5th Edition, 2016.
3	George B. Thomas, Maurice D. Weir, and Joel Hass, Thomas' Calculus, Pearson Education, 14th Edition, 2018.
4	Glyn James, Advanced Modern Engineering Mathematics, Pearson Education, 5th Edition, 2018.

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc20_ma37/preview
2	https://onlinecourses.nptel.ac.in/noc22_ma75/preview
3	https://onlinecourses.nptel.ac.in/noc19_ma28/preview

CO-PO Mapping

CO	Programme Outcomes (PO)											PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO 1	PSO 2
CO1	3	—	—	—	—	—	—	—	—	—	—	—	—
CO2	3	2	—	—	—	—	—	—	—	—	—	—	—
CO3	3	2	—	—	—	—	—	—	—	—	—	—	—
CO4	3	3	—	—	—	—	—	—	—	—	—	—	—

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing).

Walchand College of Engineering, Sangli
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AY 2026-27

Course Information

Programme	B.Tech Mechanical Engineering
Class, Semester	First Year B. Tech., Sem I
Course Code	8BS106
Course Name	Materials and Chemical Analysis
Desired Requisites:	Basic knowledge of chemistry concepts studied at higher secondary level (10+2), Fundamental understanding of physics and mathematics concepts, elementary laboratory skills and scientific understanding.

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**MSE**	**ESE**	**LA**	Total
Lab.	2 Hrs/week	20	50	30	100
		Credits: 3			

Course Objectives

1	To make students familiar with engineering principles associated with different materials to use them successfully in practice.
2	To provide knowledge and significance of characterization and chemical analysis for using materials in different engineering applications.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Descriptor
CO1	Explain the principles of chemical analysis and material characterization techniques, including qualitative and quantitative methods, gravimetric and volumetric analysis, spectroscopic techniques (Flame, UV–Vis, IR), and microscopic techniques (SEM and TEM) used for engineering materials.	II	**Understand**
CO2	Apply the structure, properties, processing, and applications of engineering materials including metals, polymers, composites, and ceramics, and relate material characteristics to mechanical engineering performance.	III	**Apply**
CO3	Analyze corrosion behavior, phase equilibria, and metallurgical processes to interpret material performance, extraction methods, and material selection for engineering applications.	III	**Analyze**
CO4	Demonstrate chemical analysis experiments, interpret experimental data, and prepare technical laboratory reports. (Lab)	III	**Apply**

Module	Module Contents	Hours
I	**Chemical analysis and Characterization of Materials:** Introduction to chemical analysis, Qualitative vs Quantitative methods, Gravimetric analysis-principles & examples, Volumetric (titrimetric) analysis, Spectroscopic techniques (Flame, UV-Vis, IR)-basic concepts, Introduction to SEM& TEM for material characterization, Application examples: alloy composition, quality evaluation.	8
II	**Structure and Properties of Engineering Materials** Atomic structure and bonding in materials, Crystalline vs amorphous solids, Defects in solids (point, line, planar), Mechanical properties: strength, ductility, hardness.	4

III	**Polymers, Composites and Ceramics:** Classification of polymers, Polymerization processes, Engineering composites-types & applications, Ceramics-properties & industrial uses.	4
IV	**Corrosion Science:** Fundamentals of corrosion, Electrochemical corrosion mechanisms, Factors affecting corrosion, Types of corrosion (uniform, pitting, crevice, galvanic), Corrosion monitoring & control, Corrosion prevention methods (coatings, cathodic protection).	6
V	**Phase Rule:** Gibbs phase rule, Explanation of the terms Phase, Component, Degree of freedom, Phase reactions, types of equilibrium, equilibrium conditions. One component system- Water system, Sulphur system, Two component system- Lead Silver system, Application of Eutectic system, Merit and Demerits of Phase rule.	4-1
VI	**Metallurgy & Metal Extraction:** Introduction to metallurgy and engineering importance of metals. Overview of extractive metallurgy processes: crushing, concentration of ores, calcination, roasting and reduction methods. Extraction of iron, aluminum and copper. Principles of pyrometallurgy, hydrometallurgy and electrometallurgy. Purification and refining of metals.	4-1

Laboratory Courses:

Sr. No.	List of Experiments (Any 8-9)	Hours
1	Estimation of hardness of water by EDTA method (Complexometric titration)	2 Hrs
2	Estimation of alkalinity of water (Neutralization titration)	2 Hrs
3	Estimation of dissolved oxygen in water (Iodometric titration)	2 Hrs
4	Estimation of chloride content in water (Argentometry)	2 Hrs
5	Demonstration of pH meter and pH metric titration	2 Hrs
6	Determination of strength of acid/base conductometrically	2 Hrs
7	Colorimetric estimation of copper	2 Hrs
8	Estimation of copper from bronze (Iodometric titration)	2 Hrs
9	Estimation of Zn from brass (Displacement titration)	2 Hrs
10	Determination of purity of iron (Redox titration)	2 Hrs
11	Determination of viscosity using Ostwald viscometer	2 Hrs
12	Determination of corrosion rate by weight loss method	2 Hrs
13	Gravimetric estimation of Ba from $BaSO_4$ as BaO	2 Hrs
14	Preparation of resin	2 Hrs
15	To prepare a single-layer PCB using the chemical etching method and understand the redox reaction involved	2 Hrs

Textbooks	
1	Engineering Chemistry Jain and Jain
2	Nanomaterial : Sulbha Kulkarni
3	Instrumental Methods of Chemical Analysis: Chatwal Anand
4	Engineering Chemistry: Shashi Chawala
5	Laboratory Manual on Engineering Chemistry: Dr Sudha Rani

References	
1	Vogel's Textbook of Quantitative Chemical Analysis

2	Engineering Chemistry: B K Sharma
3	Instrumental Methods of Analysis: Willard, Merritt, Dean & Settle
4	Practical Engineering Chemistry : S. S. Dara / S. S. Umare
5	Quantitative Chemical Analysis: S Sahay

Useful Links	
1	https://www.youtube.com/watch?v=Vl3BYsoif-c&pp=ygU3bnB0ZWwgZW5naW5lZXJpbmcgY2hlbWlzdHJ5IHNwZWN0cm9zY29weSB1diB2aXMgaXIgbWFzcw%3D%3D
2	https://www.youtube.com/@nptelhrd/search?query=vulcanization+rubber+nptel
3	https://nptel.ac.in/courses/113105077?utm_source=chatgpt.com
4	https://onlinecourses.nptel.ac.in/noc25_ee163/preview?utm_source=chatgpt.com
5	https://onlinecourses.nptel.ac.in/noc25_mm26/preview?utm_source=chatgpt.com

CO-PO Mapping

	Programme Outcomes (PO)											PSO
	1	2	3	4	5	6	7	8	9	10	11	-
CO1	3	2	2	-	-	-	-	-	-	-		-
CO2	2	2	2	-	-	-	-	-	-	-		-
CO3	3	3	2	-	-	-	-	-	-	-		-
CO4	3	3	-	3	3	-	-	2	3	-		-

The strength of mapping is to be written as 1,2,3; Where, 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing in course for a theory course, Min. 40% marks in (MSE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

Justification

Justification

CO1 → PO1, PO2, PO3

PO1: Fundamental chemistry and materials knowledge.

PO2: Interpretation of analytical and characterization data.

PO3: Understanding engineering applications and systems.

CO2 → PO1, PO2, PO3

PO1: Knowledge of metals, polymers, composites, and ceramics and their structure–property relationships.
PO2: Analysis of material properties and their influence on engineering performance.

PO3: Selection of suitable engineering materials for specific applications based on required properties.

CO3 → PO1, PO2, PO3

PO1: Application of chemistry and materials science concepts in corrosion, metallurgy, and phase equilibria.

PO2: Analysis of corrosion mechanisms, phase diagrams, and metallurgical processes.

PO3: Selection of appropriate corrosion prevention methods and suitable materials for engineering applications.

CO4 → PO1, PO2, PO3, PO5, PO8, PO9

- **PO1:** Application of chemistry principles in laboratory work.
- **PO2:** Experimental data interpretation.
- **PO4:** Conducting experiments and investigations.
- **PO5:** Use of laboratory instruments.
- **PO8:** Teamwork in laboratory activities.
- **PO9:** Technical report writing and communication.

Walchand College of Engineering, Sangli

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AY 2026-27 onwards

Course Information

Programme	B. Tech. All
Class, Semester	First Year
Course Code	8ES151
Course Name	Engineering Exploration
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**LA1**	**LA2**	**ESE**	**Total**
Interaction	-				
Tutorial	-	30	30	40	100
Practical	4 Hr /week	**Credits: 4**			

Course Objectives

1. To instil an understanding of the engineering profession
2. To impart a structured engineering design methodology
3. To build foundational skills in system modelling and analysis
4. To introduce physical computing and platform-based development
5. To foster professional ethics and sustainable engineering practices

Course Outcomes (CO)

CO	Description	Blooms Taxonomy	
		Descriptor	Level
CO1	Discuss the scope of Engineering and its study.	Understand	II
CO2	Solve real world challenges using multidisciplinary engineering skills	Apply	III
CO3	Demonstrate effective teamwork and communication skill during engineering project execution.	Apply	III
CO4	Analyse alternative design concepts using engineering criteria such as functionality, sustainability.	Analyse	IV
CO5	Develop engineering solutions using the engineering design process while considering sustainability and ethical constraints.	Create	VI

CO – PO mapping

	Programme Outcomes (PO)										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	1	-	-	-	-	1	-	-	-	-	-
CO2	2	2	-	-	2	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	3	2	-
CO4	-	2	2	-	-	-	3	-	-	-	-
CO5	-	-	3	-	-	-	1	3	-	-	-

Module	Module Contents	Hours
I	**Module 1: Introduction to Engineering and Engineering Study** Requirements and expectations of Engineering, disciplines of engineering, Expectation of modern engineer and Graduate Attributes Significance of teamwork, Significance of Agile practices, Significance of documentation	03 + 04
II	**Module 2: Sustainability and Ethics in Engineering** Introduction to sustainability, Sustainability leadership matrix, Life cycle assessment, carbon footprint, embodied energy calculation, alternative material selection and justification Identifying Engineering as a Profession, Significance of Professional Ethics, Code of Conduct for Engineers, Identifying Ethical Dilemmas in different tasks	03 + 04

	of engineering, Applying Moral Theories and codes of conduct for resolution of Ethical Dilemmas.	
III	**Module 3: Engineering Design** Engineering Design Process, Problem definition formulation process, Concept generation- Function tree, Morphological chart, and Concept selection- Pugh Chart, Material selection based on density, carbon foot-print and embodied energy, Product Architecture.	06 + 12
IV	**Module 4: Virtual Implementation** Virtual Implementation, Introduction to Engineering Drawing, Introduction to 3D modelling software, Part modelling & assembly. Circuit Diagram, Flowchart	06 + 14
V	**Module 5: Mechanisms, Motor Sizing and Battery Sizing (MSBS)** Types of mechanisms, degree of freedom, linkages, four bar linkage mechanism, actuators & its types, torque, governing equations, FOS, motor sizing, motor selection, mass identification using software, power adapters, types of adapters, power calculations & adapter selection	06 + 12
VI	**Module 6: Platform Based Development** Introduction to various platform-based development (Arduino) programming and its essentials, Introduction to sensors, transducers and actuators and its interfacing with Arduino	06 + 14
		Total Hrs: 30+60

Course Project

Physical Implementation: Prototyping planning/Prototyping Sprint Reviews 18 Hrs

Each faculty will provide a need statement to students and mentor the group of students. Each group will come up with their own solution to the need statement. Number of need statements should be equal to number faculty teaching this course.

Sample need statements

1. To automate floor cleaning and reduce human effort.
2. To automate a selected industrial processing operation.
3. To automate Waste Segregation and Recycling.
4. To digitally capture the shape and dimensions of physical objects.
5. To reduce time and effort required for fruit peeling.
6. To automate corn shelling and improve agricultural productivity.
7. To detect driver fatigue and help prevent road accidents.
8. To automate the stacking of objects for improved productivity and safety.

Expected Deliverables

1) Problem Statement
2) Objectives
3) Literature Review
4) Methodology
5) Sustainability Analysis
6) Ethical Considerations
7) Prototype/Model/Survey/Simulation
8) Results and Discussion
9) Conclusion and Future Scope
10) Presentation and Final Report

Course Assessment Plan (*for total 90 learning hours)*

Assessment No.		Formative Assessment type	Brief Description	Marks	Notional Learning hours	Week
LA1	**1**	Engineering Exploration Quiz & Reflection (individual)	Quiz or Individual reflection report on engineering disciplines, graduate attributes, ethics, sustainability and teamwork, Agile practices.	**10**	5 (1)	1–3
	2	Sustainability & Ethics Studio Activity (individual or team)	Life Cycle Assessment and carbon footprint & embodied energy calculation exercise or ethical dilemma case study analysis	**10**	5 (1)	4–7

	3	Concept Generation & Design Review (team submission)	Problem definition & formulation, concept generation (function tree, morphological chart), concept selection (Pugh chart), material selection justification	**10**	6 (1)	8-15
LA2	**4**	Virtual Implementation (individual or team)	CAD part modelling & assembly, engineering drawing.	**10**	12 (2)	1–3
	5	Motor and Battery Sizing (individual or team)	circuit diagram/flowchart, mechanism selection, motor & battery sizing calculations	**10**	10 (2)	4–7
	6	Platform-Based Development (individual or team)	Arduino programming fundamentals, sensor/transducer/actuator interfacing	**10**	10 (2)	8-15
ESE	**7**	Prototyping Sprint Review 1	Problem Statement, Objectives, Literature Review, Methodology (Project deliverables 1–4)	**15**	4 (7)	1–3
	8	Prototyping Sprint Review 2	Sustainability Analysis, Ethical Considerations, working Prototype/Model/Survey/Simulation (Project deliverables 5–7)	**15**	4 (7)	4–7
	9	Final Presentation & Report	Results and Discussion, Conclusion and Future Scope, final report + presentation (Project deliverables 8–10)	**10**	4 (7)	8-15
Total				**100**	**60** (Contact hrs) **+ 30** (Self Learning) **=90 hrs**	

Note: The Course Faculty will finalize the assessment plan (including the distribution of internal evaluations, practical rubrics, and continuous assessments) at the start of the semester in accordance with institute regulations. Any modifications will be communicated to the students in advance.

Text Books	
1	Introduction to Engineering, Paul H. Wright, Carl T. F. Ross, Wiley India, 2008
2	Engineering Design: A Project-Based Introduction. 4th ed., by Clive L. Dym and Patrick Little, John Wiley & Sons, 2013.
References	
1	Systems Engineering Principles and Practice, Alexander Kossiakoff, William N. Sweet, Samuel J. Seymour, Steven M. Biemer, Wiley, 2020
2	Engineering Ethics: Concepts and Cases, Charles E. Harris Jr., Michael S. Pritchard, Michael J. Rabins, Cengage Learning, 2018
3	Norman, D. A., The Design of Everyday Things, Revised and Expanded Edition, Basic Books, 2013.
4	Ulrich, K. T., & Eppinger, S. D., Product Design and Development, 7th Edition, McGraw-Hill, 2024.
5	Ashby, M. F., Materials Selection in Mechanical Design, 5th Edition, Elsevier, 2016.
6	Budynas, R. G., & Nisbett, J. K., Shigley's Mechanical Engineering Design, 11th Edition, McGraw-Hill, 2019.
7	White, E., Making Embedded Systems, 2nd Edition, O'Reilly Media, 2024.
Useful Links	
1	https://youtube.com/playlist?list=PL2935W76vRNEE_NNWlpUar20iUdkFQ1z2&si=-MaDgeRnw2uTllTw
2	https://onlinecourses.nptel.ac.in/e-learning/preview/noc22_mg54
3	https://onlinecourses.nptel.ac.in/e-learning/preview/noc25_mg63
4	https://www.youtube.com/playlist?list=PLGxa5y5etMwAY238yKu1orXTnzD9h5nL_
5	https://docs.arduino.cc/

Walchand College of Engineering, Sangli

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AY 2026-27

Course Information	
Programme	B.Tech. Mechanical Engineering)
Class, Semester	First Year B. Tech., Sem I/II
Course Code	8ES104
Course Name	Engineering Mechanics
Desired Requisites:	Physics, Mathematics

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ESE**	**LA**	**Total**
Tutorial	---	20	50	30	100
		Credits: 3			

Course Objectives	
1	To impart knowledge on fundamentals of mechanics
2	To provide knowledge of basic concepts and system of forces in statics and dynamics
3	To illustrate the principles of mechanics in engineering applications

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Explain concept & principles of forces with respect to engineering applications	II	Understanding
CO2	Apply the concepts of force, stresses and strains for analysis of trusses and solid bodies	III	Applying
CO3	Apply the concepts of Newton's laws of motion, D'Alemberts principles to solve problems related to dynamic system	III	Applying
CO4	Apply Newton's laws and D'Alembert's principle to dynamic systems.	IV	Apply

Module	**Module Contents**	**Hours**
I	**Forces, Centroid and Moment of Inertia** Fundamentals, Systems, Composition and Resolution, Resultant of planar force systems. Free Body Diagram, Laws of Forces, Varignon's Theorem, Centre of gravity and Centroid, Moment of Inertia of Plane figure, Composite Sections, Radius of gyration, Mass-Moment of Inertia.	9
II	**Equilibrium** Equilibrium conditions, Lami's Theorem Concept of determinacy and indeterminacy, Beams: Types of Supports, Loads and Reactions Principle of Virtual Work and its applications to statically determinate beams	7
III	**Basic Civil Engineering – I** Introduction to Civil Engineering, Types of Structural Systems - Load Bearing Structures, Framed Structures, Pre-engineered Buildings (PEB), Prefabricated Structures, Types of Loads on Structures- Dead Load, Live Load, Wind Load, Earthquake Load, Snow and Other Environmental Loads Types of Foundations - Shallow Foundations, Deep Foundations, Selection Criteria for Foundations	4
IV	**Plane Trusses** Pin-jointed statically determinate plane trusses: Assumptions, imperfect, perfect and redundant trusses, Analysis by Method of joints, method of sections	6

V	**Dynamics of Particles:** Rectilinear Motion, Motion of Projectile, Kinetics – Newton's laws of motion, D'Alemberts principle, Applications to rough inclined plane, lift, and connected bodies, Collisions: Impact, Collision of bodies, Coefficient of Restitution, Loss of Kinetic Energy due to Impact	8
VI	**Basic Civil Engineering – II** Construction Materials – Cement, Concrete, Steel, Bricks, Bitumen, Building Bye-laws, Principles of Building Planning – Orientation, Aspect, Prospect, Privacy, Grouping of Rooms, Circulation, Lighting and Ventilation, Sanitation, Economy and Aesthetics	6

List of Experiments / Lab Activities/Topics

List of Experiments:

1. Verification of law of triangle of forces
2. Verification of law of polygon of forces
3. Determination of support reactions for Simply Supported Beam
4. Verification of the principle of moments using Bell crank lever apparatus
5. Determination of the coefficient of friction for motion on horizontal plane
6. Determination of the coefficient of friction for motion on inclined plane
7. Analysis of concurrent and non-concurrent coplanar force system by graphical method
8. Analysis of statically determinate beams by graphical method
9. Analysis of pin jointed perfect plane frames by graphical method
10. Field test on cement and bricks
11. Study of plan elevation section of residential, commercial and industrial building.

Textbooks

1	Ramamrutham., S. "Textbook of Applied Mechanics", Dhanpat Rai Publishing Company Limited, 2008.
2	Bhavikatti., S. S. and Rajashekarappa., K. G. "Engineering Mechanics", New Age International Publishers, 2015, 5th Edition.
3	Beer, F. P. and Johnston, E. R. "Vector Mechanics for Engineers Vol. I and II", McGraw Hill Company Publication, 2011, 9th Edition.

References

1	Singer, F. L. "Engineering Mechanics Statics & Dynamics", B. S. Publications, 2011.
2	Timoshenko, S. and Young, D. H. "Engineering Mechanics", McGraw Hill Companies, 2008, 4th Edition.
3	Meriam, L. and L.G. Kraige, "Engineering Mechanics – Dynamics", John Wiley & Sons, 2002, 6th Edition.
4	F. P. Beer and E. R. Johnston, Mechanics of materials, McGraw-Hill International

Useful Links

1	https://nptel.ac.in/courses/112106286
2	https://www.youtube.com/watch?v=9Yt3I4bP-90

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3													
CO2	3	1												
CO3	3	1												
CO4	1													

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment
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AY 2026-27

Course Information

Programme	B.Tech. Mechanical Engineering
Class, Semester	First Year B. Tech. SEM-I
Course Code	8ME101
Course Name	Introduction to Engineering Drawing
Desired Requisites:	Basic Knowledge of Different Types of Curves, Line and Planes.

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	1 Hrs/week	**MSE**	**ESE**	**LA**	**Total**
Tutorial	-	20	50	30	100
		Credits: 1			

Course Objectives

1	Ability to understand and apply the fundamentals of engineering drawing and graphical representation.
2	Familiarize students with different types of lines, lettering, dimensioning, and standard drawing practices used in engineering.
3	Enable students to draw and interpret plane figures, lines, and curves accurately using drawing instruments and CAD tools wherever applicable.
4	Develop visualization and spatial skills required for understanding engineering components and technical drawings.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Demonstrate standard engineering drawing conventions, lettering, dimensioning, and different types of lines in technical drawings.	I	Demonstrating
CO2	Construct geometrical figures, curves, and plane geometries accurately using engineering drawing principles.	II	Understanding
CO3	Draw and interpret projections of points, lines, planes and simple engineering objects.	III	Applying
CO4	Develop engineering visualization skills to prepare and understand basic technical and graphical representations used in engineering practice.	IV	Analysing

Module	**Module Contents**	**Hours**
I	**Introduction to Engineering Drawing / Curves** Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales;	4
II	**Projection of Lines** Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes, Skew Lines, Parallel Lines, Perpendicular Lines using auxiliary methods;	5
III	**Projection of Planes**	4

	Principles of Orthographic Projections-Conventions - Projections of planes inclined Planes - Auxiliary Planes;	

Module wise Measurable Students Learning Outcomes :
After the completion of the course the student should be able to:
The student will learn :

[1] Identify and use standard engineering drawing instruments, line types, lettering styles, and dimensioning practices as per BIS/ISO standards.

[2] Construct geometrical entities such as lines, polygons, conic sections, and engineering curves with at least 90% accuracy.

[3] Prepare orthographic projections of points, lines, and planes using proper projection methods and drawing conventions.

[4] Interpret and create basic engineering drawings demonstrating visualization, spatial understanding, and graphical communication skills.

List of Experiments

SN	Title of Practical	Details of Practical
1	Introduction to Engineering Drawing Standards and Instruments	Drawing instruments, sheet layout, BIS standards, types of lines, lettering styles, and title block preparation.
2	Dimensioning Methods and Conventional Representation of Materials	Aligned and unidirectional dimensioning, conventional symbols, and section lining of engineering materials.
3	Basics of Limits, Fits, Tolerances, and Surface Finish Symbols	Representation of limits, fits, tolerances, surface roughness symbols, and machining symbols in drawings.
4	Construction of Basic Geometrical Figures and Scales	Construction of polygons, circles, tangents, plain scales, and diagonal scales.
5	Construction of Conic Sections	Construction of ellipse, parabola, and hyperbola using standard geometrical methods.
6	Construction of Engineering Curves	Drawing of cycloid, epicycloid, involute of circle, and Archimedean spiral.
7	Projection of Points and Straight Lines	Orthographic projection of points and straight lines in different quadrants and positions.
8	Projection of Straight Lines Inclined to HP and VP	Determination of true length, true inclinations, and traces of lines inclined to both reference planes.
9	Projection of Plane Surfaces	Projection of square, rectangle, pentagon, hexagon, and circular planes inclined to HP and VP.
10	Combined Assignment on Curves, Lines, and Planes	Integrated problems involving geometrical constructions, curves, projections of lines, and plane surfaces.
11	AutoCAD Practice – Basic Drawing Commands and Dimensioning	AutoCAD interface, drawing commands, modify commands, layers, line types, and dimensioning tools.
12	AutoCAD Practice – Curves and Engineering Drawing Conventions	Drawing of conic sections, engineering curves, section lining, and standard conventions using AutoCAD.
13	AutoCAD Practice – Projection of Lines and Planes	Preparation of orthographic projections of points, lines, and plane surfaces using AutoCAD.

Text Books

1	Bhatt N.D., Panchal V.M. and Ingle P.R., Engineering Drawing, Charotar Publishing House, 2014.
2	Shah, M.B. and Rana B.C., Engineering Drawing and Computer Graphics, Pearson Education, 2008.
3	Agrawal B. and Agrawal C. M., Engineering Graphics, TMH Publication, 2012.

References

1	Narayana, K.L. and P Kannaiah, Text book on Engineering Drawing, Scitech Publishers, 2008.
2	Warren J. Luzzader, Fundamentals of Engineering Drawing, Prentice Hall of India, New Delhi, 2010
3	Fredderock E. Giesecke, Alva Mitchell others, Principles of Engineering Graphics, Maxwell

	McMillan Publishing, 2010
Useful Links	
1	https://nptel.ac.in/courses/112/103/112103019/
2	https://nptel.ac.in/courses/105/104/105104148/
3	https://www.youtube.com/watch?v=xXdpkQXDuMw&list=PL9RcWoqXmzaJT-fliqTSwUjWU4zCX_H2A

CO-PO Mapping For Mechanical Engineering Department															
	Programme Outcomes (PO)												**PSO**		
	1	2	3	4	5	6	7	8	9	10	11		1	2	
CO1	3				2					1			2		
CO2			2										1		
CO3					3					1			2		
CO4											3		1		
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															

Assessment
The assessment is based on MSE, ISE and ESE. MSE shall be typically on modules 1 to 3. ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO. ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6. For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

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Course Information

Programme	B.Tech. Mechanical Engineering
Class, Semester	First Year B. Tech. SEM-I
Course Code	8VS153
Course Name	Workshop 1
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2Hrs/Week	**LA1**	**LA2**	**ESE**	**Total**
Interaction	-	**30**	**30**	**40**	100
		Credits: 1			

Course Objectives

1	To train the students to use different tools and equipments involved in the manufacturing processes
2	To develop the skills to handle the basic cutting tools and devices required for various manufacturing processes, interpret the given job drawing, select relevant fitting tools
3	To prepare the students to carry out the various operations to make a finished product
4	To prepare approximate Estimate of material requirement in constructed structure and to calculate FSI

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Select and use appropriate woodworking, fitting, and sheet metal tools and equipment for basic manufacturing operations.	II	Understand
CO2	Perform woodworking, fitting, and sheet metal operations using appropriate tools, measuring instruments, and safety practices to prepare simple engineering jobs.	III	Apply
CO3	Carry out building layout activities including line-out, establishment of verticality, right-angle corners, and level differences in construction work.	III	Apply
CO4	Analyze building plans to estimate material quantities and calculate FSI for simple structures.	IV	Analyze

List of Experiments / Lab Activities

List of Experiments [Mechanical]:

1. Introduction to **woodworking**,the hand tools required and machines:
   Perform Planing operation,Cutting by chisel to prepare small **wooden job** [Square joint type] (4 Hrs)
2. Introduction to **fitting shop** tools, equipment/machines:
   Job consisting of **male and female parts** viz.one with groove, another with matching projection,holes on both and their assembly, as per given job drawing.
   operations to be performed:Marking,Punching, Sawcutting,Drilling, Edge filing operations (6 Hrs.)
3. Introduction to **sheet metal work** : Job of small **sheet metal tray** as per given job drawing with following operations: Marking,Cutting,bending/folding (4 Hrs.)

List of Experiments [Civil]:

1. Establishing verticality right angle corner level difference in masonry construction (2 Hrs)
2. Line out building plan on site (2 Hrs)
3. Estimate quantities/ material (4Hrs)
   a) Brickwork
   b) Concrete component
   c) Flooring
4. Sketching of building plan and calculation of FSI (2Hrs)

Text Books [Mechanical]	
1	Raghuwanshi B. S.,"A Course in Workshop Technology I",Dhanpat Rai Publications,10th Ed.,2009
2	S. K. Hajra Choudhury and A. K. HajraChoudhary,"Workshop Technology" – Vol I [Manufacturing Processes]",Media Promoters and Publishers Pvt. Ltd., 10th edition, reprint 2001
3	Bawa . H S . "Workshop Practice, " McGraw Hill Education, Noida, 2nd edition ,2009 ISBN-13: 978-0070671195
4	Gupta, J. K . ; Khurmi , "A Textbook of Manufacturing Process" (Workshop Tech.) R S S Chand and Co., New Delhi,2020, ISBN:81-219-3092-8
5	Singh Rajender, "Introduction to Basic Manufacturing Process and Workshop Technology ",New Age International, New Delhi; 2014, ISBN: 978-81-224-3070-7
References [Mechanical]	
1	W.A.J. Chapman, "Workshop Technology Volume I", CBS Publishing & Distributors, Delhi. [ISBN-13:9788123904016] 2001
2	Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGraw Hill House,2017
3	Gowri P. Hariharan and A. Suresh Babu, "Manufacturing Technology – I" Pearson Education, 2008
Text Books [Civil]	
1.	Hirasakar G. K., "Basic Civil Engineering", DhanpatRai publications, 1st Edition,2007
2.	Gole L.G., "Introduction to Civil Engineering", Mahu Publisher House, 4th Edition, 2005
3.	Bhavikatti S.S., "Basic Civil Engineering", New Age Publications, 2010
References [Civil]	
1	Duggal S.K., "Surveying (Vol I)", Tata McGraw Hill, 4th edition 2013
2	Bindra S.P., Arora S.P. , "Building Construction", Dhanpat Rai publication, 5th edition, 2012

Useful Links	
1	https://www.vlab.co.in/broad-area-mechanical-engineering
2	https://drive.google.com/file/d/1tp5yV2ghp_Slub58S7iKnvvJyoEwQVYq/view
3	https://www.youtube.com/@workshop.supdtjmdabir5653
4	https://www.youtube.com/watch?v=gPaBULgRRuM
5	https://www.youtube.com/watch?v=-f7tTNRH_04
6	https://www.youtube.com/watch?v=UD3q5R0N8U4
7	https://www.youtube.com/watch?v=uapzeNwKq4U
8	https://www.youtube.com/watch?v=jbRgJbIGAwc
9	https://www.youtube.com/watch?v=TeErxz59Sss
10	https://www.youtube.com/watch?v=F4SwbJ1euB8
11	https://www.youtube.com/watch?v=cuv-tP6JHEI
12	https://www.youtube.com/watch?v=vUIY_BiLyFI
13	https://www.youtube.com/watch?v=xMQOR6Jg304
14	https://www.youtube.com/watch?v=OdrBpPNJMaI
15	https://www.youtube.com/watch?v=uAIXHqOm0AM
16	https://www.youtube.com/watch?v=DzCBASUKpF4
17	https://www.youtube.com/watch?v=TQ_NeHenT9Y
18	https://www.youtube.com/watch?v=rkp2Uvpop-g
19	https://www.youtube.com/watch?v=iDJ_sMvXsYs
20	https://www.youtube.com/watch?v=xZgtyNdGHvs

CO-PO Mapping														
	Programme Outcomes (PO) Mechanical											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3			1										
CO2	3	2		1										
CO3	3	2			1									
CO4	3	3	1								1			
	Programme Outcomes (PO) Civil											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3													
CO2	3	2												
CO3	3	2			2									
CO4	3	3	1		1						1			

Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.

Assessment	Based on	Conducted by	Typical Schedule (for 26-week Sem)	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40

Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings,
programming and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments.

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Course Information

Programme	First Year B. Tech.
Class, Semester	Sem I and Sem II
Course Code	8AE151
Course Name	Professional Communication
Desired Requisites:	10+2 level English

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	---	**LA1**	**LA2**	**ESE**	**Total**
Tutorial	1Hr/week	30	30	40	100
Practical	---				
Interaction	1Hr/week	**Credits: 2**			

Course Objectives

1	Enable clear, confident, and context-aware communication (verbal, non-verbal, written, digital)..
2	Prepare students to understand and apply effective listening, feedback and professional writing skills required for academic and career contexts.
3	Develop oral communication skills including public speaking, group discussion, debate and persuasion skills
4	Inculcate understanding of teamwork, collaboration, and digital communication, and equip students with personal branding and career communication skills.

Course Outcomes (CO) with Bloom's Taxonomy Level

CO1	Communicate clearly, confidently, and competently in diverse real-world scenarios	Apply
CO2	Demonstrate adequate proficiency in language.	Apply
CO3	Demonstrate communication skills (LSRW) in personal and professional settings.	Apply
CO4	Work effectively in teams and apply communication and interpersonal skills for career readiness.	Apply

Module	Module Contents	Hours
	Foundations of Communication	
1	Communication -Nature, Types, and Principles. Barriers to Effective Communication and overcoming them. Developing Effective Listening Skills: Types, listening and note-making.	**2**
	Language Skills & Communicative Grammar	
2	Vocabulary precision, clarity. Modal verbs, passives, phrasal verbs. Common errors & editing Communicative Grammar: modal verbs, question tags, misplaced modifiers, passives Reading comprehension	**2**
	Non-Verbal Communication & Vocalics	
3	Understanding Non-Verbal Communication — Scope and Significance, Codes of non-verbal communication. Vocalics —Understanding Pronunciation, Intonation, and Voice modulation, eliminating fillers Developing Non-verbal skills for professional settings	**3**
	Formal Oral Communication Skills	
4	Presentation Skills — Structure, Delivery and Confidence. Techniques for public speaking. Group Discussion: Types, Dynamics, and Techniques Introduction to Debate: Structured Arguments and Rebuttal Techniques	**2**
	Professional Writing & Business Communication	
5	Introduction to academic writing. Principles of Professional Writing: Brevity, Clarity and Pragmatic writing, Cover letter writing. Résumé Writing: Formats, ATS Compatibility	**2**
	Interpersonal, Teamwork & Career Communication Skills	
6	Interpersonal skills- Significance, Emotional Intelligence (EQ) —Cores of Emotional Intelligence Team Building: Definition, Hierarchy and Team Dynamics Personal Branding in the Digital Age — LinkedIn and Social Media Strategy Interview Skills: Types, STAR Method, Mock Interview Preparation	**3**

Textbooks	
1	Adler, R.B. & Rodman, G. — Understanding Human Communication, Oxford University Press

2	Sanjay Kumar & Pushpalata — Communication Skills, Oxford University Press, First Edition, 2012
3	Cialdini, R. — Influence: The Psychology of Persuasion, Harper Business
References	
1	Ashraf Rizvi, Effective Technical Communication, Tata McGraw Hills publishing Company 2006
2	William Sanborn Pfeiffer, T.V.S. Padmaja, Technical Communication: A Practical Approach, Pearson, Sixth Edition 2012
3	Reynolds, G. — Presentation Zen: Simple Ideas on Presentation Design and Delivery, New Riders
4	Exercises in Spoken English, Parts I and II, CIEFL, Hyderabad, Oxford University Press
Useful Links	
1	www.ted.com/talks — TED Talks on Communication

CO-PO Mapping

	Programme Outcomes (PO)											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1									3		2			
CO2									3		2			
CO3							2		2		2			
CO4								3	2		2			

The strength of mapping is to be written as 1,2,3; Where, 1: Low, 2: Medium, 3: High

Each CO of the course must map to at least one PO.

Course Assessment Plan — Notional Learning Hours

Professional Communication | First Year B Tech | Sem I & II | Credits: 2 | Total NLH: 60

Sl. No.	Assessment Type	Brief Description	Marks	Notional Learning Hours (NLH)	A T*	CO Mapped	Bloom's Taxonomy Level
1	Tutorial Exercise	Structured exercises based on Module I & II topics	20	8	LA1	CO2	Apply (L3)

Sl. No.	Assessment Type	Brief Description	Marks	Notional Learning Hours (NLH)	A T*	CO Mapped	Bloom's Taxonomy Level
2	Listening + Note-Making Task	Audio-visual listening exercise with note-making and summary writing from Module I	10	8	LA1	CO1, CO2	Apply (L3)
3	Oral Presentation	Individual 10-minute structured presentation evaluated via rubric (Module IV)	10	10	LA2	CO1, CO3	Apply (L3)
4	Group Discussion / Debate	Mock GD / Debate on current affairs or case-based topics (Module IV)	10	10	LA2	CO3, CO4	Apply (L3)
5	Professional Writing Task	Email makeover + Résumé peer review using ATS simulation (Module V)	10	8	LA2	CO1, CO4	Apply (L3)
6	End-Semester Examination	Oral exam covering all 6 modules (30–40% weightage on Modules 1–3; 60–70% on Modules 4–6)	40	16	ESE	CO1–CO4	Apply (L3)
		Total	**100**	**60**	—		

Notes: | **AT**= Assessment Type. NLH **= Notional Learning Hours** includes lecture contact hours, tutorial hours, self-study, and assessment preparation. | Total NLH = 60 (as per 2-credit course norm: 1 credit = 30 NLH).

F.Y. Mechanical Sem-II syllabus w.e.f. 2026-27

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AY 2026-27 onwards

Course Information

Programme	B.Tech.
Class, Semester	First Year (Mechanical), Semester II
Course Code	8BS107
Course Name	Differential Equation and Complex Variables
Desired Requisites:	Mathematics course at Higher Secondary Level

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**MSE**	**ESE**	**ISE**	**Total**
Tutorial	1 Hrs/week	30	50	20	100

Credits: 03

Course Objectives

1	To introduce basic techniques for solving higher-order linear differential equations.
2	To present foundational concepts of periodic functions and boundary-value problems.
3	To outline elementary numerical schemes for approximating differential equation solutions.
4	To detail introductory concepts of complex variables and analytic functions.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statements**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Descriptor**
CO1	**Understand** the fundamental properties of Fourier series expansions and analytic functions of complex variables.	II	Understanding
CO2	**Apply** analytical and numerical techniques to solve differential equations	III	Applying
CO3	**Apply** separation of variables and Lagrange's method to solve partial differential equations.	III	Applying
CO4	**Apply** complex integration and residue calculus theorems to solve engineering problems.	III	Applying

Module	**Module Contents**	**Hours**
I	**Higher-Order Linear Differential Equations** Complimentary function, particular integral for exponential function, trigonometric function, polynomial and arbitrary function, Cauchy Euler Equation, Applications for Mechanical Engineering.	**5**
II	**Fourier Series** Definition and Euler formulae, even and odd functions, Fourier series for arbitrary period, Fourier sine and cosine series.	**5**
III	**Partial Differential Equations** Introduction, Classification of PDEs, Lagrange's Linear Partial Differential, One-Dimensional Wave Equation, one dimensional heat equation,	**4**

IV	**Numerical Solutions to Ordinary Differential Equation** Introduction, Euler's Method, Modified Euler's method, Runge Kutta 4th order method.	**5**
V	**Complex Analysis I** Analytic function, Cauchy Riemann equation, Complex integral, Cauchy integral Theorem	**4**
VI	**Complex Analysis II** Taylor's series, Maclaurin's series, Laurent's series, Residue Theorem.	**5**

Textbooks	
1	B. V. Ramana, Higher Engineering Mathematics, The McGraw Hill companies, 2006.
2	H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., 1st Edition, 2014.
3	Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition

References	
1	Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, Inc., 10th Edition, 2015.
2	R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing House, 5th Edition, 2016.
3	George B. Thomas, Maurice D. Weir, and Joel Hass, Thomas' Calculus, Pearson Education, 14th Edition, 2018.

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc22_ma75/preview
2	https://onlinecourses.nptel.ac.in/noc25_ma122/preview
3	https://onlinecourses.nptel.ac.in/noc20_ma50/preview

CO-PO Mapping

CO	Programme Outcomes (PO)											PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO 1	PSO 2
CO1	2	2	—	—	—	—	—	—	—	—	—	—	—
CO2	3	2	—	—	—	—	—	—	—	—	—	—	—
CO3	3	3	—	—	—	—	—	—	—	—	—	—	—
CO4	3	3	—	—	—	—	—	—	—	—	—	—	—

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing).

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Course Information

Programme	First Year B. Tech. Mechanical Engineering
Class, Semester	First Year B. Tech., Sem. II
Course Code	8BS108
Course Name	Applied Physics
Desired Requisites:	Basic concepts of 10+2 level Physics.

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**MSE**	**ESE**	**LA**	**Total**
Practical	2 Hrs/week	20	50	30	100
		Credits: 3			

Course Objectives

1	To provide fundamental scientific concepts for solving engineering and technical problems.
2	To develop analytical and critical thinking skills required for engineering studies.
3	To enhance the understanding of modern engineering and technological developments.
4	To develop experimental skills and the ability to analyze and interpret engineering data.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Exhibit memory of previously learned information by recalling facts, terms, and basic concepts in Physics.	I	Remember
CO2	Demonstrate understanding of facts and ideas by recalling, comparing, interpreting the terms in Physics.	II	Understand
CO3	Solve problems to new situations by applying acquired knowledge, facts, techniques and rules for various concepts in Physics.	III	Apply
CO4	Analyze engineering systems for solving problems.	IV	Analyze

Module	**Module Contents**	**Hours**
I	**Modern Physics and Quantum Mechanics**: Introduction, Black Body Radiation, Planck's Quantum Theory, de-Broglie Hypothesis, Compton Effect, Heisenberg Uncertainty Principle, Wave Function and Physical Significance, Schrödinger Wave Equation, Eigen Value, Eigen Function.	5
II	**Wave Optics:** Introduction, Interference and Diffraction of Light, Fresnel Diffraction Including Half-Period Zones and Zone Plate, Fraunhofer Diffraction due to Single slit and Plane Diffraction Grating.	5
III	**LASER:** Introduction, Principle and Working of LASER, Different Types of LASER, Properties of LASER, Applications of LASER in Science and Engineering.	4

IV	**Solid State Physics:** Introduction, crystal structure, crystalline and amorphous solids, Bravais lattices, Miller indices, atomic packing factor (APF), crystal defects, Semiconductors: formation of energy bands, classification of solids based on band theory, Fermi–Dirac statistics, Fermi level and its temperature dependence.	5
V	**Sensors and Transducers:** Introduction, classification, characteristics, and operating principles of sensors and transducers, Strain Gauges, Pressure Sensors, Temperature Sensors, Piezoelectric Sensors, Optical Sensors, Applications of Sensors and Transducers in Mechanical Engineering.	4
VI	**Nanoscience and Nanotechnology:** Introduction, Nanoscale and Nanomaterials, Classification of Nanomaterials, Properties of Nanomaterials, Synthesis of Nanomaterials: Top-Down and Bottom-Up Approaches, Graphene, Carbon Nanotubes, Applications of Nanotechnology in Mechanical Engineering.	3

List of Experiments/ Lab Activities (Any 8-10)	
1	Find the diameter of thin wire by diffraction of light.
2	Determination of wavelength of light by plane diffraction grating.
3	Determine the specific rotation of sugar solution.
4	Find the wavelength of He-Ne LASER using plane diffraction grating.
5	Verify the expression for the resolving power of a telescope.
6	Measure the wavelength of ultrasonic waves by Kundt's tube method.
7	Design and simulate Colpitt's Oscillator.
8	Determine the Planck's constant.
9	Study the I-V characteristic of P-N junction diode in forward and reverse bias conditions.
10	Determine the wavelength of Sodium Light by Newton's Ring.
11	Study of Rectifier circuits.
12	To study the Hall effect and determine the Hall coefficient and carrier concentration of a semiconductor material.
13	To study the I-V characteristics of a transistor and determine its current gain.
14	To study and verify the truth tables of logic gates.
15	To study and analyze electronic circuits and systems using MATLAB & SPICE simulation tools.

Textbooks	
1	M. N. Avadhanulu and P. G. Kshirsagar, "A Text book of Engineering Physics", S.Chand Pub.
2	Bhattacharya & Nag, Engineering Physics.
3	Harnam Singh, *Advanced Practical Physics for Students*, S. Chand & Company Ltd., Revised Edition, 2011, Volumes I & II.

References	
1	Beiser, Arthur, **Concepts of Modern Physics**, McGraw-Hill Education, **7th Edition, 2015.**
2	Ghatak, Ajoy, **Optics**, McGraw-Hill Education, **6th Edition, 2017.**
3	Patranabis, D**., Sensors and Transducers**, Prentice Hall of India, **2nd Edition, 2003.**
4	Streetman, Ben G. and Banerjee, Sanjay Kumar, **Solid State Electronic Devices**, Pearson Education, **7th Edition, 2015.**
5	Thyagarajan, K. and Ghatak, A. K., **Lasers: Fundamentals and Applications**, Springer, **2nd Edition, 2010.**

Useful Links	
1	https://onlinecourses.nptel.ac.in/e-learning
2	https://swayam.gov.in/nc_details/NPTEL
3	https://ocw.mit.edu/search/

CO-PO Mapping

	Programme Outcomes (PO)											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	3	1									1		
CO2	3	2		1							1		
CO3	3	3	2	2							1		
CO4	3	3	3	2							1		

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment (Theory)

The assessment is based on MSE and ESE.
MSE shall be typically on modules 1 to 3.
ESE shall be on all modules with around 30% weightage on modules 1 to 3 and 70% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

Assessment (Lab)

There is one component of lab assessment that is Lab ESE.
IMP: Lab ESE is a separate head of passing (min 40 %).

Assessment	Based on	Conducted by	Typical Schedule	Marks
Lab ESE	Lab Activities/ Journal/ Performance/ Presentations/ Oral/ Mini Project	Lab Course Faculty and External Examiner as applicable	During Week 1 to Week 13. Marks Submission at the end of Week 13.	30

Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.

Syllabus Prepared By	Dr. A. A. Mohite, Dr. B. N. Jamadar and Dr. K. V. Madhale
Syllabus Checked By	Head, Department of Mechanical Engineering

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Course Information

Programme	B.Tech. Mechanical Engineering
Class, Semester	First Year B. Tech. SEM-II
Course Code	8ES105
Course Name	Engineering Graphics
Desired Requisites:	Basic Knowledge of Drawing

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**MSE**	**ESE**	**LA**	**Total**
Tutorial	-	20	50	30	100
		Credits: 1			

Course Objectives

1	To develop the ability to visualize and represent three-dimensional engineering solids through orthographic projection techniques.
2	To impart knowledge of development and intersection of solids for engineering and manufacturing applications.
3	To familiarize students with conventional representation and detailed drawing of mechanical components, fasteners, and machine elements.
4	To introduce assembly drawing, part detailing, and CAD applications for preparation of professional engineering drawings.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Draw and interpret projections of various engineering solids in different orientations using standard projection methods.	I	Demonstrating
CO2	Prepare development of surfaces and curves of intersection of solids for engineering applications.	II	Understanding
CO3	Apply standard conventions to represent and detail mechanical components and machine elements in engineering drawings.	III	Applying
CO4	Create assembly and detailed drawings of mechanical components using manual drafting and CAD tools following standard engineering practices.	IV	Analysing

Module	**Module Contents**	**Hours**
I	**Projection of Solids** Introduction to solid geometries and classification of solids. Projection of simple solids such as prism, pyramid, cylinder, cone, and sphere with axis perpendicular to HP and parallel to VP. Projection of solids with axis inclined to HP and parallel to VP, and solids with axis inclined to VP and parallel to HP. Combination of solids and development of visualization techniques for engineering applications.	8
II	**Development of Surfaces and Intersection of Solids** Principles and applications of development of surfaces. Development of prism, pyramid, cylinder, and cone using radial line and parallel line development methods. Introduction to intersection of solids including cylinder with cylinder, cylinder with prism, and cone with cylinder. Drawing of curves of intersection	5

	and their engineering applications.	
III	**Mechanical Components and Fasteners** Conventional representation of machine components and standard drawing practices. Study of screw threads, types of nuts, bolts, washers, studs, and locking devices. Introduction to keys, cotters, riveted joints, couplings, bearings, springs, pipe joints, and welded joints with their conventional representation in engineering drawing.	8
IV	**Assembly and Detailed Drawings with CAD Applications** Principles of assembly drawing and detailed part drawing. Preparation of detailed drawings from assembly drawings including sectional views. Representation of limits, fits, tolerances, and surface finish symbols in production drawings. Introduction to CAD applications for mechanical component drafting, assembly drawings, and detailing using AutoCAD.	5

List of Experiments / Lab Activities

Exp. No.	Title of Experiment	Content / Scope
1	Projection of Simple Solids	Drawing projections of prism, pyramid, cylinder, cone, and sphere with axis perpendicular to HP and parallel to VP using CAD tools. Understanding visible and hidden edges in orthographic views.
2	Projection of Solids with Axis Inclined to HP	Preparation of projections of prisms, pyramids, cylinders, and cones with axis inclined to HP and parallel to VP using change of position method in AutoCAD.
3	Projection of Solids with Axis Inclined to VP	Drawing projections of solids with axis inclined to VP and parallel to HP. Visualization and interpretation of front view, top view, and side view using CAD applications.
4	Development of Surfaces and Intersection of Solids	Development of surfaces of prism, pyramid, cylinder, and cone using radial line and parallel line methods. Drawing intersections of cylinder with cylinder, cylinder with prism, and cone with cylinder with engineering applications.
5	Orthographic Projection of Machine Components	Preparation of first-angle and third-angle orthographic projections of simple machine components using AutoCAD with proper dimensioning and standard conventions.
6	Conversion of Isometric View to Orthographic View	Drawing orthographic views from given isometric drawings of mechanical objects and components using CAD software.
7	Isometric Projection and Isometric View	Preparation of isometric projections and isometric views of solids and machine components using AutoCAD isometric drafting tools and dimensions.
8	Conventional Representation of Threads and Fasteners	Drawing and representation of screw threads, nuts, bolts, washers, studs, and locking devices according to BIS standards using CAD applications.
9	Drawing of Keys, Cotters, Riveted and Welded Joints	Preparation of detailed drawings of keys, cotters, riveted joints, welded joints, and their conventional representation in engineering drawing.
10	Drawing of Couplings, Bearings and Springs	CAD drafting of flange coupling, muff coupling, bearings, and helical springs with sectional views and standard drawing practices.
11	Drawing of Pipe Joints and Assembly Components	Preparation of pipe joints, unions, valves, and simple assembly drawings using AutoCAD with proper conventions and dimensions.
12	Detailed Drawing from Assembly Drawing	Preparation of detailed part drawings from given assembly drawings including sectional views, dimensions, and production details using AutoCAD.
13	Assembly Drawing with Tolerances and Surface Finish Symbols	Preparation of assembly drawings using CAD applications with representation of limits, fits, tolerances, surface roughness symbols, and standard production drawing practices.

Text Books

1	Bhatt N.D., Panchal V.M. and Ingle P.R., Engineering Drawing, Charotar Publishing House, 2014.
2	Shah, M.B. and Rana B.C., Engineering Drawing and Computer Graphics, Pearson Education, 2008.
3	Agrawal B. and Agrawal C. M., Engineering Graphics, TMH Publication, 2012.
References	
1	Narayana, K.L. and P Kannaiah, Text book on Engineering Drawing, Scitech Publishers, 2008.
2	Warren J. Luzzader, Fundamentals of Engineering Drawing, Prentice Hall of India, New Delhi, 2010
3	Fredderock E. Giesecke, Alva Mitchell others, Principles of Engineering Graphics, Maxwell McMillan Publishing, 2010
Useful Links	
1	https://nptel.ac.in/courses/112/103/112103019/
2	https://nptel.ac.in/courses/105/104/105104148/
3	https://www.youtube.com/watch?v=xXdpkQXDuMw&list=PL9RcWoqXmzaJT-fliqTSwUjWU4zCX_H2A

CO-PO Mapping For Mechanical Engineering Department															
	Programme Outcomes (PO)												**PSO**		
	1	2	3	4	5	6	7	8	9	10	11		1	2	
CO1	3				2					1			2		
CO2			2										1		
CO3					3					1			2		
CO4											3		1		
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															

Assessment
The assessment is based on MSE, ISE and ESE. MSE shall be typically on modules 1 to 3. ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO. ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6. For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

Walchand College of Engineering, Sangli

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AY 2026-27

Course Information	
Programme	B. Tech. (Mechanical Engineering)
Class, Semester	First Year B. Tech. Sem. II
Course Code	
Course Name	Basics of Electrical and Electronics Engineering
Desired Requisites:	12th Physics

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**MSE**	**ESE**	**ISE**	**Total**
Tutorial	-	30	50	20	100
		Credits: 3			

Course Objectives	
1	This course intends to summarize and solve electrical and magnetic circuits.
2	It imparts skill to identifying principles, construction and working of electrical machines.
3	To **explain** the difference between analog and digital electronic circuits.
4	To **explain** the working of diode circuits, transistorized and op-amp based amplifiers.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	**Explain** principles, construction and workings of electrical machines, and apply electrical safety and wiring practices.	II	Understanding
CO2	**Solve** the electrical and magnetic circuits problems using fundamental circuit laws.	III	Applying
CO3	**Explain** the fundamentals of digital electronics.	I	Understanding
CO4	**Solve** the examples on digital circuits, diodes and transistors and Op-amp based circuits.	III	Applying

Module	**Module Contents**	**Hours**
I	**Module 1: Electrical Circuit Fundamentals** Electrical quantities and circuit elements (R,L,C), Ohm's law, KCL & KVL, Series and Parallel circuits, AC fundamentals, RMS value, Real, Reactive and Apparent power, Power factor and its significance in industrial electrical systems.	5

II	**Module 2: Electrical Machines** Magnetic circuits: magnetic flux, MMF and Faraday's law of electromagnetic induction, **DC Motor:** Construction, working principle, applications and torque- speed characteristics, **Three Phase Induction Motor:** Construction, working principle, types and applications, torque- speed characteristics, **Single Phase Transformer:** Construction, working principle, types and applications.	5
III	**Module 3: Electrical Safety, Wiring and Protection** Electrical hazards and safety precautions, Earthing and grounding, Protective devices (Fuse, MCB and RCCB), Electrical wiring, Electrical energy conservation.	4
IV	**Module IV: Fundamentals of Digital Electronics** Number systems and binary arithmetic , Logic gates and truth tables ,Boolean algebra and K-map simplification , Combinational circuits (Half Adder, Full Adder) ,Subtractor, Comparator, Introduction to Sequential Circuits (Flip-flops) , Applications in industrial automation and control	5
V	**Module V: Electronic Devices and Sensors** Semiconductor basics , Diodes and rectifiers ,LED, ,Photodiode, Solar Cell, Pressure Sensor, Proximity and Position Sensors , LDR and Temperature Sensors , Sensors used in CNC machines, automobiles and industrial automation.	5
VI	**Module VI: Engineering Measurement and Instrumentation** Measurement systems and standards ,Static and dynamic characteristics of instruments, Sensors and transducers ,Temperature measurement , Pressure measurement , Flow measurement ,Speed measurement ,Data acquisition basics , Industrial applications	4

Textbooks

1	D.C. Kulshreshtha, "Basic Electrical Engineering", 1st revised edition McGraw Hill, 2012.
2	D.P Kothari and I.J Nagrath, "*Basic Electrical Engineering",* Tata McGraw Hill, 2010.
3	B.L Theraja "A Textbook of Electrical Technology", S Chand Publication, 2013.
4	R. P. Jain, "Modern Digital Electronics", 4th edition, Tata McGraw Hill, 2009.
5	Robert Boylestad, Louis Nashelsky, 11th edition, "Electronic Devices and Circuits, Pearson, 2015.
6	Ramakant Gaikwad, "Op-amp and Linear Integrated Circuits", 4th edition, Pearson, 2015.

References

1	V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.
2	E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
3	V. N. Mittle and Arvind Mittal, "Basic Electrical Engineering", 2nd edition, Tata McGraw Hill.
4	Morris Mano, "Digital Design", Pearson, 4th edition, 2011
5	Donald A. Neamen, "Electronic Circuit Analysis and Design", 3rd edition, Tata McGraw Hill, 2011
6	Robert F. Coughlin and Frederick F. Driscoll, "Operational Amplifiers and Linear Integrated Circuits", 6th edition, PHI, 2009

Useful Links

1	Basic Electrical Technology, IISc Bangalore, by Prof. L. Umanand, "https://nptel.ac.in/courses/1081

	08076”
2	Basic Electrical Technology, IIT Kharagpur, by Prof. N.K. De, Prof. G.D. Roy, Prof. T.K. Bhattacharya, “https://nptel.ac.in/courses/108105053”
3	Fundamentals of Electrical Engineering, IIT Kharagpur,by Prof. Debapriya Das , “https://nptel.ac.in/courses/108105112”
4	https://nptel.ac.in/courses/108101091
5	https://nptel.ac.in/courses/108105113

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2												
CO2	3	3				2								
CO3	2	2												
CO4	2	2												

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on Three modules. (One and half modules from Electrical syllabus and one and half modules from Electronics syllabus)
ISE shall be taken throughout the semester in the form of teacher’s assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules up to MSE and 60% weightage on modules after MSE.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

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AY 2026-27 onwards

Course Information

Programme	B. Tech. Engineering
Class, Semester	F.Y. B.Tech. Sem: II
Course Code	8IK151
Course Name	Indian Knowledge System
Desired Requisites:	Basic knowledge of Indian Civilization

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	-	**MSE**	**ESE**	**ISE**	**Total**
Interaction	2 Hrs/week	30	40	30	100
Tutorial	-				
Practical	-	**Credits: 2**			

Course Objectives

To introduce undergraduate students to the ancient Indian technologies that exemplify the ingenuity and achievements of India's glorious civilization.

To emphasize the nature-centric aspects of ancient Indian technologies and explore their relevance and adoption in the modern era.

To expose students to the scientific principles and technological advancements of ancient India and explore their potential applications in modern technological development.

Course Outcomes

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

CO	**Description**	**Blooms Taxonomy**	
		Level	**Descriptor**
CO1	Enumerate the main characteristics of education system in Vedic and post Vedic period to enrich the intellectual imagination	I	Remember
CO2	Review the ancient discovery and research in Indian number system and ancient Indian mathematics	II	Understand
CO3	Review the contribution from Ancient Indian system to astronomy and metallurgy	III	Understand
CO4	Trace the significant developments in Indian engineering and technology in Irrigation, painting, surgical techniques and shipbuilding	IV	Apply
CO5	Cultivate a deep sense of identity and pride in enriched scientific Indian heritage	V	Evaluate

CO – PO mapping

	Programme Outcomes (PO)										
COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	1					1					2
CO2	2	3									1
CO3	1			1	2	3					
CO4			3	2		2	1				

Module	Module Contents	Hours
I	**Introduction to Ancient Indian Science and Technology** What is Indian Knowledge System (IKS)? Why do we need it? Salient aspects of IKS. The Vedic Corpus: Introduction to Vedas, Sub-classification of Vedas, Messages in Vedas, Vedic Life: A Distinctive Features, Art and Crafts in ancient India	5
II	**Ancient Indian Mathematics** Number systems in India, Measurements for time, distance, and weight, Bhūta-Saṃkhyā system, Kaṭapayādi system, Piṅgala and the Binary system. Unique aspects of Indian Mathematics, Indian Mathematicians and their Contributions, Algebra, Geometry and Trigonometry	8
III	**Ancient Indian Astronomy, and Sustainable Technologies** Indian contributions in astronomy, The celestial coordinate system, Elements of the Indian calendar, Notion of years and months, Indian Astronomical Instruments Wootz Steel, Mining and ore extraction, Metals and Metalworking Technology, Iron and steel in India, Lost wax casting of idols and artefacts, Apparatuses used for extraction of metallic components	8
IV	**Ancient Indian Water Conservation, Irrigation, Ayurveda and Animal Husbandry** Irrigation systems and practices in South India, Dyes and painting technology, Surgical techniques, Shipbuilding. Temple architecture in India, Perspective of Arthaśāstra on town planning.	5
	Total Hrs	**26**

Course Assessment Plan (*for total 26 learning hours)*

Assessment	Formative Assessment type	Brief Description	Marks	Notional Learning hours	week

ISE/LA1	Suggested Creative Activity (any one)	1. Article Reflection 2. Book Design (preferably flip-book) on a given topic 3. Any other suggested by teacher	**10**	**8**	**3**
	Suggested creative activity -2 (any one)	1. Exploration Visit Report 2. Short Film Making 3. Any other suggested by teacher	**20**	**5**	**5**

MSE/ LA2	Creative Activity-3:	Quiz: 30 Marks	**30**	**8**	**1-8**
ESE	Creative Activity-3	1. App Making/ Game Design/Website Design 2. Physical Prototype 3. Design of Experiment 4. Any other suggested by teacher	**40**	**5**	**1-8**
		Total	**100**		**26 hrs**

Text Books/References	
1	B Mahadevan, Vinayak Rajat Bhat, Nagendra Pavana R. N., "*Introduction to Indian Knowledge System: Concepts and Applications*" PHI, 2022
2	Kapil Kapoor, Avadhesh K. Singh, "*Indian Knowledge Systems, Volume 1*", Indian Institute of Advanced Study, 2005
3	R. P. Kulkarni, "*Glimpses of India Engineering and Technology: Ancient and Medieval Period*," Munshiram Manoharlal Publishers Pvt. Ltd., 2018
Useful Links	
1	https://iksindia.org/
2	https://egyankosh.ac.in/
3	https://www.ugc.ac.in/
4	https://ncert.nic.in/textbook.php

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Course Information

Programme	B.Tech. Mechanical Engineering
Class, Semester	First Year B. Tech., Sem II
Course Code	8ES106
Course Name	Computer Programming
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Interaction	1 Hrs/week	**LA1**	**LA2**	**ESE**	**Total**
Tutorials	--	30	30	40	100
Practical	2 Hrs/week	**Credits: 2**			

Course Objectives

1. To understand problem solving and problem solving aspects.
2. To learn basics, features and future of Python programming.
3. To acquaint with data types, input output statements, decision making, looping, functions, array, string, pointer, structure and union in Python

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description
CO1	Inculcate the various skills in Problem Solving.	II	Understand
CO2	Demonstrate significant experience with the Python Programming.	III	Apply
CO3	Apply functions and file-handling techniques in Python to develop modular programs and process data stored in files.	III	Apply
CO4	To test and execute the Python programs and correct syntax and logical errors.	IV	Analyse

Module	Module Contents	Hours
I	**Basics of Problem Solving**: General Problem Solving Concepts, Types of Problems, Problem Solving Strategies. Program Design Tools: Algorithms, Flowcharts and Pseudo-Codes.	2
II	**Python Programming:** Writing and Executing Python Program, Variables, Keywords, Identifiers, Constants, Operators & Expressions, Operators, Data Types.	2
III	**Decision Control Statements:** Conditional Statements: If, If-else, Nested If, If-else if Statements. Iterative Statements: While Loop, For Loop, Do While Loop, Break, Continue, Pass.	2
IV	**Functions:** Need, Definition, Call, Variable Scope, Return Statement, Lambda or Anonymous Function. Modules: Definition, Introduction to packages in Python, Introduction to standard library modules.	3

V	**Strings and Operations:** Concatenation, Appending, Multiplication and Slicing. Strings are Immutable, Strings Formatting Operator.	2
VI	**File Handling:** Introduction, File path, Types of files, Opening and Closing files, Reading and Writing files.	2

List of Experiments/ Lab Activities / Mini project activities….	
1)	Program to simulate simple calculator that performs basic tasks such as addition, subtraction, multiplication and division.
2)	Program to demonstrate different operators and their order precedence
3)	Program to accept the number and Compute a) Square root of number, b) Square of number, c) Cube of number d) Check for prime, d) factorial of number,
4)	Program to accept a number from user and print digits of number in a reverse order
5)	Program to accept two numbers from user and compute smallest divisor and Greatest Common Divisor of these two numbers.
6)	Program to find whether the number is positive / negative / zero using conditional statement.
7)	Programs to show different types of iteration / loop.
8)	Program to accept N numbers from user and compute and display maximum in list, minimum in list, sum and average of numbers.
9)	Program to print the Fibonacci Series (with & without recursion).
10)	Program to swap two number using function.
11)	Program to accepts a string from user and perform following string operations, a) Calculate length of string, b) String reversal, c) Check palindrome,
12)	Program to demonstrate different file handling functions.
13)	Program to copy contents of one file to other.

Textbooks	
1	Reema Thareja, “Python Programming Using Problem Solving Approach”, Oxford University Press, ISBN 13: 978-0-19-948017-6.
2	R. Nageswara Rao, “Core Python Programming”, Dreamtech Press; Second edition ISBN10: 938605230X, ISBN-13: 978-9386052308 ASIN: B07BFSR3LL.

References	
1	Maureen Spankle, “Problem Solving and Programming Concepts”, Pearson; 9th edition, ISBN 10: 9780132492645, ISBN-13: 978-0132492645.
2	Romano Fabrizio, “Learning Python”, Packt Publishing Limited, ISBN: 9781783551712, 1783551712.
3	Martin C. Brown, “Python: The Complete Reference”, McGraw Hill Education, ISBN-10: 9789387572942, ISBN-13: 978-9387572942, ASIN: 9387572943.
4	Jeeva Jose, P. Sojan Lal, “Introduction to Computing & Problem Solving with Python”, Khanna Computer Book Store; First edition, ISBN-10: 9789382609810, ISBN-13: 978-9382609810

Useful Links	
1	https://www.w3schools.com/python
2	https://www.geeksforgeeks.org/python-programming-language

CO-PO Mapping (Theory)

	Programme Outcomes (PO)											**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	3	2											
CO2	1		2		2								
CO3		2	1	2									
CO4		2	1	2									

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment		
LA1	Lab activities, attendance, Submission. During Week 1 to Week 8.	30 Marks
LA2	Lab activities, attendance, Submission. During Week 9 to Week 12.	30 Marks
ESE	Lab activities/ submission/ performance. During week 13 to 15	40 Marks

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Course Information

Programme	B.Tech. (Mechanical Engineering)
Class, Semester	First Year B. Tech. SEM-II
Course Code	8ME102
Course Name	Basic Mechanical Engineering
Desired Requisites:	Physics

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3Hrs/week	**MSE**	**ESE**	**LA**	**Total**
Tutorial	-	20	50	30	100
		Credits: 3			

Course Objectives

1	To engage students in analysing mechanisms used in Mechanical Engineering
2	To prepare the students for applying concepts of motion transmission using mechanisms and gears

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	**Recall** the basic principle of Mechanical Engineering domain.	I	Remember
CO2	**Understand** the fundamental concepts and principles of mechanical engineering systems and energy conversion processes.	II	Understanding
CO3	**Identify** various mechanical components, power transmission elements, robotics systems, and industrial processes used in engineering applications.	II	Understanding
CO4	**Apply** the knowledge of Manufacturing Systems in real life applications.	III	Applying

Module	**Module Contents**	**Hours**
I	**Basic Thermodynamics** Basic Concepts: Thermodynamic system, Equilibrium etc. Thermodynamic work and Heat, I and II Laws of thermodynamics and their applications in Engineering, Heat Engine, Refrigerator and Heat pump, Carnot Principle.	6
II	**Introduction to IC Engines and Power Generation** Classification, Applications, Basic terminology, 2 and 4 stroke IC engine working principle, Power Plant: Types of Power plant; Gas power plant, Thermal power plant, Nuclear power plant.	7

III	**Introduction to Manufacturing processes** Classification of manufacturing processes, Introduction to casting process, machining : Lathe ,Drilling, Milling and Grinding: principle, types advantages and limitations, metal joining processes : Soldering, Brazing and Welding basics.	7
IV	**Metrology and Inspection Basics:** linear and angular measurements; Vernier caliper and micrometer, Limits, fits, and tolerances gauges and comparators basics, industrial inspection practices.	7
V	**Basics of Machines and Mechanisms** Objective of kinematic analysis of mechanism, classification of links, pairs, Basic terminology and kinematic symbols, kinematic chains, plane motion; constraints and degrees of freedom, mechanism and machines, inversion of mechanisms along with their practical applications.	6
VI	**Elements of Power Transmission** Gears: Classification and Basic terminology, Introduction to belt and chain drives, types of belt drives, shafts, keys, couplings, sliding and rolling contact bearings **Introduction to Robotics**: Robot anatomy, Joints and links and common robot configuration, Applications	7

List of Experiments / Lab Activities

List of lab activities:

1. Study and demonstration of the steam power plant.
2. Study and demonstration of two-stroke and four stroke internal combustion engines
3. Study and demonstration of the refrigeration and air conditioning system.
4. Study and demonstration of pumps.
5. Demonstration of manufacturing processes (Casting, Pattern making etc)
6. Demonstration of manufacturing processes (Welding, Soldering, Brazing)
7. Demonstration of basic conventional machining processes (Lathe, Drilling, Milling)
8. Demonstration of linear and angular measurement techniques.
9. Demonstration of various types of gauges and comparator.
10. Study of basic mechanisms like four bar, slider crank, etc.
11. Study of gear tooth profiles and demonstration of power transmission elements.

Text Books

1	S S Rattan, Theory of Machines, McGraw Hill, 3rd edition, 2016
2	R,Yadav, Applied Thermodynamics, Central Publishing House, 3rd Edition, 2011
3	Katsundo Hitomi, Manufacturing Systems Engineering: A Unified Approach to Manufacturing Technology, Production Management and Industrial Economics, 2017
4	Jeff Hansen, Manufacturing Systems Engineering, Willford Press, 2017
5	Mikell P. Groover, "Fundamentals of Modern Manufacturing: Materials, Processes, and Systems," Wiley, 2015.

References

1	Den Hartog, Jacob P., Strength of Materials. Dover Publications Inc., 3rd Edidtion 1961
2	Yunus A Cengel and Michael Boles, Thermodynamics:An engineering approach, McGraw Hill, 9th Edition, 2015
3	Serope Kalpakjian and Steven R. Schmid, "Manufacturing Engineering and Technology," Pearson, 2013.
4	George F. Schrader and Ahmad K. Elshennawy, "Fundamentals of Manufacturing," Society of Manufacturing Engineers, 2012.
5	Richard Crowson, "Introduction to Manufacturing Processes," McGraw-Hill Education, 2017.

Useful Links

1	https://archive.nptel.ac.in/courses/112/104/112104188/
2	https://nptel.ac.in/courses/112103316
3	https://nptel.ac.in/courses/112104304

4	https://nptel.ac.in/courses/112104769

CO-PO Mapping For Mechanical Engineering Department															
	Programme Outcomes (PO)												PSO		
	1	2	3	4	5	6	7	8	9	10	11		1	2	
CO1	**3**												**2**		
CO2	**3**	**2**											**2**		
CO3	**2**	**2**			**1**								**3**		
CO4	**2**	**2**	**2**										**3**		
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															
Assessment															
The assessment is based on MSE, ISE and ESE. MSE shall be typically on modules 1 to 3. ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO. ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6. For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)															

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Course Information

Programme	B. Tech. Mechanical Engineering
Class, Semester	First Year B. Tech., Sem.-II
Course Code	8VS154
Course Name	Workshop 2
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2 Hrs/Week	**LA1**	**LA2**	**ESE**	**Total**
Interaction	-	30	30	40	100
		Credits: 1			

Course Objectives

1	To provide basic knowledge of handling electrical equipment and safety.
2	To impart skills to plan and implement simple electrical wiring.
3	To provide exposure to the students with hands on experience on various basic engineering practices in Electrical and Electronics Engineering.
4	To explain the working of small electronic gadget like electronic bell, emergency lamp etc.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Perform welding, grinding, plumbing, and inspection activities using appropriate tools and safety practices.	III	Applying
CO2	Identify and use industrial inspection tools and robotic/automation components for basic engineering applications.	III	Applying
CO3	Identify and Test simple electronic gadget, instruments etc	II	Understanding
CO4	Identify the instruments for measurement of electrical parameters.	III	Applying

List of Experiments / Lab Activities/Topics

1. Study and Preparation of Lap Joint by Arc Welding. (2 labs)
2. Study and perform basic grinding operation using Grinding Machine.
3. Assemble and dismantle basic plumbing fittings (elbows, tees, couplings, valves), identify domestic water supply components.
4. Industrial Inspection of Engineering Components using Gauges and Inspection Tools.
5. Study of Robot Anatomy and Automation Components.
6. Electronics Experiment – I

7.	Electronics Experiment – II
8.	Electronics Experiment – III
9.	Electrical Experiment – I
10.	Electrical Experiment – II
11.	Electrical Experiment – III

Textbooks	
1	**Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy,** *Elements of Workshop Technology – Vol. I*, Media Promoters & Publishers Pvt. Ltd., 14th Edition, 2010.
2	Electronics Projects For Dummies, by by Earl Boysen and Nancy Muir, Published by Wiley Publishing, Inc., 2006
3	D.C. Kulshreshtha, "Basic Electrical Engineering", 1 st revised editionMcGraw Hill, 2012.
4	D.P Kothari and I.J Nagrath, "Basic Electrical Engineering",Tata McGraw Hill, 2010.
References	
1	Paul Horowitz, Winfield Hill, "The Art of Electronics", Cambridge University Press, 1989
2	E-learning material through Intranet/Internet
3	V. N. Mittle and Arvind Mittal, "Basic Electrical Engineering", 2 nd edition, Tata McGraw Hill.
4	Bolton W., *Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering*, Pearson Education, 7th Edition, 2019.
Useful Links	
1	Lectur 1 & 2 - Basic Electrical Technology
2	Preview: Production Technology: Theory and Practice | SWAYAM

CO-PO Mapping

	Programme Outcomes (PO) Mechanical											**PSO**		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2			3									
CO2	2	2			3									
CO3	2													
CO4	2	1			2									

The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High

Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%

Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40

Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.