General Engineering

CO of All Semesters

Program Outcomes (POs)

At the end of successful completion of program, the graduates will be able to—

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life- long learning in the broadest context of technological change.

SEMESTER I

		Physics Group	
Sr. No	**Code No.**	**Subject**	**Credits**
1.	BSC-P-101	Engineering Physics	4
2.	BSC-M-I-102	Engineering Mathematics-I	4
3.	ESC-P-103	Basic Electrical Engineering	4
4.	ESC-P-104	Basic Civil Engineering	4
5.	ESC-P-105	Engineering Graphics	4
6.	HM-I-106	Professional Communication-I	2
7.	ESC-W-I-107	Workshop Practice-I	2
		Total	**24**

Sr. No	Sem.	Code No.	Subject	Credits
1	I	BSC-P-101	Engineering Physics	4

COs:

At the end of the course the students should be able to:

1. To acquire and apply basic knowledge of Physics in technical fields

2. Bring adaptability to new developments in Engineering Physics
   and to acquire the skills required to become a perfect engineer.

3. To integrate pure Physics principles and fundamentals with
   Engineering Applications.

Syllabus:

Course	Teaching Scheme				Evaluation Scheme				
						Theory(Marks)		Practical(Marks)	
	L	**T**	**P**	**Credit**	**Scheme**	**Max.**	**Min. for Passing**	**Max.**	**Min. for passing**
Engineering Physics	03	-	01	04	ISE	-	-	25	40%
					MSE	30	40%	-	-
					ESE	70	40%	-	-

ISE: In Semester Evaluation   MSE: Mid Semester Evaluation   ESE: End Semester Evaluation

SECTION – I

Unit 1.   Diffraction and Polarization of Light :(12 Marks)(7)

Diffraction : Diffraction- Concept and types (Fresnel and Fraunhofer diffraction), Diffraction grating – construction and theory, resolving power of plane transmission grating.

Polarization**:** Introduction, double refraction, Huygens' theory (positive and negative crystals), Optical Activity, Specific Rotation, Laurent's half shade polarimeter.

Unit 2.   Laser and Fibre Optics:(12 Marks)(7)

LASER : Absorption, spontaneous emission, stimulated emission, pumping, population inversion, Ruby

laser, characteristics of laser, Holography (construction and reconstruction)
Fibre Optics :Total Internal Refection, structure of optical fibre, acceptance angle, acceptance cone, numerical aperture and fractional refractive index change (noderivation), fibre optic communication system, advantages of optical fibres.

Unit 3.   Sound: (11 Marks) (7)

Conditions for good acoustics, Reverberation, Reverberation time, Sabine's formula for reverberation time (no derivation), Absorption coefficient, Factors affecting architectural acoustics and their remedy.

SECTION – II

Unit 4.Crystal Physics: (12 Marks)(7)

Space Lattice, Basis and Crystal structure, Unit cell, Seven crystal system, number of atoms per unit cell, coordination number, atomic radius, packing fraction, relation between density and lattice constant, Miller indices - procedure, features and sketches for different planes, symmetry elements of cubiccrystal, Bragg's law for X-ray diffraction.

Unit 5. Physics of Nano-materials: (12 Marks)(7)

Concept- Nanomaterial, Nanoscience and Nanotechnology, production techniques(Top down and bottom up), Ball milling and Colloidal technique for synthesis of nano particles, Types of Nanomaterial, Tools- Scanning Tunneling Microscope and Atomic Force Microscope, properties and applications of nano-materials.

Unit 6.QuantumMechanics   (11 Marks)(7)

Wave-particle duality of light, dual nature of matter (De-Broglie's concept of matter waves) Wavelengthof matter wave in terms of K.E. and P. D., Properties of matter waves, Heisenberg's uncertainty principle for position and momentum, Compton Effect (Statement, explanation and experimental verification).

List of Experiments;

Minimum 8 experiments should be performed from the following list.

01. Bi-prism experiment
02. Diffraction at Cylindrical obstacle.
03. Calculation of divergence of LASER beam.
04. Determination of wavelength of LASER using diffraction grating.
05 Wavelength of different spectral lines of mercury using grating.
06. Polarimeter.
07. Verification of inverse square law of intensity of light.
08. Resolving power of Telescope
09. Measurement of band gap energy.
10. Study of crystal structure.
11. Study of symmetry elements of cubic crystal.
12. Determination of 'd' (interplaner distance) using XRD pattern.
13. Study of Planes with the help of models related Miller Indices.
14. Determination of e/m of an electron
15. R. P. of grating

References :

1. R. K. Gaur & Gupta S. L, Engineering Physics –Dhanapat Rai Publication.
2. M. N. Avadhanulu & P. G. Kshirsagar - A Text Book of Engineering Physics -S. Chand Publication.
3. B. L. Theraja -Modern Physics - S. Chand & Company Ltd., Delhi.
4. Subramanyam & BrijLal, A Text Book of Optics –S. Chand & Company (P.) Ltd.
5. B. K. Pandey and S. Chaturvedi- Engineering Physics, Cengage Learning-2012
6. S. O. Pillai, Solid State Physics : Structure & Electron Related Properties, Eastern Ltd,, New Age International Ltd.
7. Charles Kittle, Introduction to Solid State Physics - Wiley India Pvt. Ltd.(8thEdtion).
8. V. Rajendran – Engineering Physics- Mc. Graw Hills
9. Alan Giambattista and others- Fundamentals of physics, Tata Mc. Graw Hills
10. Vijay Kumari- Engineering Physics, Vikas Publications
11. Resnick Halliday, Physics Volume-I, Krane -John Wiley & Sons Pub.
12. Resnick Halliday, Physics Volume-II, Krane -John Wiley & Sons Pub.
13. Hitendra K. Malik, A. K. Singh – Engineering Physics - Tata Mc. Graw Hills Education Private Ltd.
14. A. Beiser – Concepts of Modern Physics - Tata Mc. Graw Hills
15. L. J. Schiff – Quantum Mechanics - Tata Mc. Graw Hills

Sr. No	Sem.	Code No.	Subject	Credits
2	I	BSC-M-I-102	Engineering Mathematics-I	4

COs:

At the end of the course the students should be able to :
1. Apply the knowledge of matrices to find rank, solutions of Simultaneous Linear Equations
2. Use the knowledge of matrices to find Eigen values & Eigen vectors.
3. Find the roots of Complex numbers and use in engineering applications
4. Solve the Simultaneous Linear Equations numerically and apply in engineering applications
5. Understand the concept of limits and expansion of functions.
6. Use knowledge of derivative for Partial differentiation & its applications.

Syllabus:

Course	L	T	P	Credit	Scheme	Theory(Marks)		Practical(Marks)	
						Max.	Min. for Passing	Max.	Min. for Passing
Engineering Mathematics-I	03	1	-	04	ISE	-	-	25	40%
					MSE	30	40%	-	-
					ESE	70	40%	-	-

ISE: In Semester Evaluation   MSE: Mid Semester Evaluation   ESE: End Semester Evaluation

SECTION I
Unit 1: Matrices and Solution of Linear System Equations(8)
(Weightage 15 Marks in Shivaji Uni Exam of 70 marks)
1. Rank of matrix: definition, normal form and echelon form
2. Consistency of linear system equations
3. System of linear homogeneous equations
4. System of linear Non-homogeneous equations

Unit 2: Eigen Values and Eigen vectors(7)
(Weightage 10 Marks in Shivaji Uni Exam of 70 marks)

1. Eigen Values
2. Properties of Eigen Values
3. Eigen vectors
3. Properties of Eigen vectors
4. Cayley-Hamilton's theorem (Without proof)

Unit 3: Complex Numbers   (6)
(Weightage 10 Marks in Shivaji Uni Exam of 70 marks)
1. De Moivre's Theorem (Without proof)
2. Roots of complex numbers by using De Moivre's Theorem
3. Expansion of $\sin n\theta$ and $\cos n\theta$ in powers of $\sin\theta$ and /or $\cos\theta$.
4. Circular functions of a complex variable –
definitions
5. Hyperbolic and Inverse Hyperbolic Functions-
definitions

SECTION II

Unit 4: Numerical Solution of linear simultaneous equations: (6)
(Weightage 10 Marks in ShivajiUni Exam of 70 marks)
1. Gauss elimination method
2. Gauss-Jordan method
3. Jacobi's iteration method
4. Gauss-Seidel iteration method

Unit 5: Expansion of Functions and Indeterminate forms: (7)
(Weightage 10 Marks in Shivaji UniExam of 70 marks)
1. Maclaurin's theorem
2. Standard expansions
3. Taylor's theorem
4. Indeterminate forms and L' Hospital's rule

Unit 6: Partial Differentiation:(8)
(Weightage 15 Marks in Shivaji Uni Exam of 70 marks)
1. Partial derivatives: Introduction
2. Total derivatives
3. Differentiation of implicit function
4. Euler's theorem on homogeneous function of two variables
5. Jacobian and its Properties .

6. Maxima and Minima of functions of two variables

General Instructions:
1. Batch wise tutorials are to be conducted. The number of students per batch should be as perthe university pattern for practical batches.
2. Minimum number of assignments should be 8 covering all topics.

Recommended Books:
1. A text book of Applied Mathematics, Vol.I by P. N. Wartikar& J. N. Wartikar, PuneVidyarthi Griha Prakashan, Pune.
2. Higher Engineering Mathematics by Dr. B. S. Grewal, Khanna Publishers, Delhi.

Reference Books:
1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley India Pvt. Ltd.
2. Advanced Engineering Mathematics by H. K. Dass, S. Chand, New Delhi.
3. A text book of Engineering Mathematics Volume I by Peter V. O'Neil and Santosh K.Sengar,Cengage Learning.
4. Mathematical methods of Science and Engineering by Kanti B. Datta, Cengage Learning.
5. Numerical methods by Dr. B. S. Grewal, Khanna Publishers, Delhi.
6. A text book of Engineering Mathematics by N. P. Bali, Iyengar, Laxmi Publications (P)Ltd.,NewDelhi.

Sr. No	Sem.	Code No.	Subject	Credits
3	I	ESC-P-103	Basic Electrical Engineering	4

COs:
At the end of the course the students should be able to :
1) Define the basic parameters of AC,DC and Magnetic circuit.
2) Explain the working principle of single phase transformer and different types of lamps
3) Solve the numerical based on AC, DC circuits and efficiency & losses of transformer.
4) Classify the different types of earthing and transformer.

Syllabus:

Course	Teaching Scheme					Evaluation Scheme			
						Theory(Marks)		Practical(Marks)	
	L	T	P	Credit	Scheme	Max.	Min. for Passing	Max.	Min. for Passing
Basic Electrical Engineering	03	-	02	04	ISE	-	-	25	40%
					MSE	30	40%	-	-
					ESE	70	40%	-	-

ISE: In Semester Evaluation   MSE: Mid Semester Evaluation   ESE: End Semester Evaluation

SECTION I

Unit1: Analysis of D.C. circuits: (8)

(Weightage 12 Marks in Shivaji Uni Exam of 70 marks)

Concept of E.M.F, Potential Difference, Current, Resistance, Ohm's Law

Kirchhoff'slaws, mesh and node analysis

(Numerical on Mesh and Nodal Analysis of Two loops)

Unit 2: Magnetic circuits:(8)

(Weightage 11 Marks in Shivaji Uni Exam of 70 marks)

Concept of mmf, reluctance, magnetic flux, Magnetic Flux density,

Magneticfield strength, BH curve, magnetic leakage, fringing, Comparison of

Electric and Magnetic circuit, series magnetic circuits (Theoretical Concepts

only).

Unit 3: Single phase AC Circuits: (8)

(Weightage 12 Marks in Shivaji Uni Examof 70 marks)

Fundamentals of Alternating quantities, Faraday's Law, Types of Induced

E.M.F ,Generation of sinusoidal voltage, concept of R.M.S. & Average value,

form factor, Peak Factor, Pure Resistive, Inductive, Capacitive , R-L,   R-C,

R-L-C seriescircuits, powers, Significance of power factor.

(Numerical Treatment on Series R-L, R-C, R-L-C circuits)

SECTION II

Unit 4: Three phase A.C. Circuits   (7)

(Weightage 12 Marks in Shivaji Uni Examof 70 marks)

Advantages of 3 phase system, Generation of 3 phase AC supply, balanced 3

phase load, relation between line and phase quantities for star connected circuit and

delta connected circuit.

Unit 5:Earthing and lamps: (7)
(Weightage 11 Marks in Shivaji Uni Exam of 70 marks)

Necessity of Earthing, Earthing methods, Fuse (rewireble and HRC). MCB,

Incandescent Lamp, Fluorescent tube, CFL, LED lamp, Mercury vapour lamp,

singleline diagram of electrical systems.

Unit 6: Single phase Transformer: **(8)**

(Weightage 12 Marks in Shivaji Uni Examof 70 marks)

   Construction, operating principle, Types, emf equation, Ratios of voltage and current, operation on no load and with load, power losses, efficiency, voltage regulation, applications.
(Numerical Treatment on E.M.F Equations &Transformer losses and Efficiency)

List of Experiments
 Minimum 8 experiments should be performed from the following list.
1. Laboratory Sessions covering,General Introduction to Electrical Engineeringlaboratory, Experimental Set ups, Instruments etc.. Electrical Symbols.
2. Electric Shocks and precautions against shocks(Do's and Don'ts) .
3. Study of Ohm's Law.
4. Verification of Kirchhoff's Voltage Law and Kirchhoff's Current Law.
5. B-H curve of magnetic material.
6. Study of Faraday's law.
7. Determination of Reactance's for Series R-L- C Circuit.
8. Measurement of active and reactive power in balanced 3-phase circuit usingTwo-watt meter method.
9. Study of Basic methods of Earthing. Use of Fuse and Miniature Circuit breaker.
10. Study of different luminaries including Incandescent lamp, Mercury vapor lamps,fluorescent tube, CFL, and LED lamps.
11. Polarity and Ratio Test for single Phase Transformer.
12. Pre-determination of efficiency and regulation by Open Circuit and Short circuittests on single phase transformer.
13. Determine the Efficiency of single Phase Transformer by Direct Loading Test

   Reference books:
   1. P.V.Prasad and S.Shivan Raju – Electrical Engineering concepts andApplications – Cengage learning.
   2. B.L.Theraja – Electrical Technology vol.1. – S.Chand.
   3. B.L.Theraja – Electrical Technology vol.2. – S.Chand.

4. NagrathI.J. and D.P.kothari – Basic Electrical Engineering(2001) – TataMcGraw Hill.

5. .Bharati Dwivedi and Anurasg Tripathi – Fundamentals of Electrical Engineering – Willey Precise

Sr. No	Sem.	Code No.	Subject	Credits
4	I	ESC-P-104	Basic Civil Engineering	4

COs:

At the end of this course, student will be able
1) Describe relevance of Civil Engineering.
2) List different building components.
3) Identify significance of building system.
4) Demonstrate the use of different survey instruments for the field operations.
5) Illustrate surveying problems.
6) Classify various branches of Civil Engineering such as Transportation, Environmental and Irrigation.

Syllabus:

Course	Teaching Scheme					Evaluation Scheme				
						Theory(Marks)		Practical(Marks)		
	L	T	P	Credit	Scheme	Max.	Min. for Passing	Max.	Min. for Passing
Basic Civil Engineering	03	-	02	04	ISE	-	-	25	40%
					MSE	30	40%	-	-
					ESE	70	40%	-	-

ISE: In Semester Evaluation   MSE: Mid Semester Evaluation   ESE: End Semester Evaluation

SECTION I
Unit 1: Relevance of Civil Engineering and Building Planning(7)
Introduction, branches of civil engineering, application of civil engineering in other allied fields. Principles of planning, introduction to Bye-Laws regarding building line, height of building, open space requirements, F.S.I., setbacks, ventilation, sanitation as per municipal corporation area requirement.

Unit 2: Components of Building (7)
A) Sub-structure: Types of soil and rocks as foundation strata, concept of bearing capacity, types of foundations i.e. shallow and deep and their suitability. Shallow foundation such as wall foundation, isolated foundation, deep foundation such as pile foundation.
B) Super-structure: Elements of super-structures and their functions

Unit 3: Building Materials and Design (7)
Use and properties of the following materials--Concrete – ingredients and grades, plain and reinforcedcement concrete and ready mix concrete, bricks, steel, timber, roofing materials etc.

Introduction to types of loads, load bearing and framed structures.

SECTION II
Unit 4: Linear and Angular Measurements(7)
Principles of surveying, Classification of surveys, Chain Surveying, Introduction to metric chain and tapes, error in chaining, nominal scale and R.F., ranging, chaining and offsetting, index plan, location sketch and recording of field book, Chain and compass survey, Meridian, bearing and its types, systemof bearing, Types of compass: prismatic and surveyor's compass. Calculation Ofincluded angles, correction for local attraction.

Unit 5: Leveling (7)
Terms used in leveling, use of Dumpy level and Auto Level, temporary adjustments. Methods of reduction of levels, types of leveling, Contours, characteristics of contours, use of contour maps.Introduction and use of EDM's with special reference to Total Station.Measurement of area by planimeter – mechanical and digital.

Unit 6: Introduction to Transportation, Environmental and Irrigation Engineering (7)
Components of rigid and flexible pavement, components of railway track (Broad Gauge)Components ofwater supply scheme (flow diagram), Necessity of Irrigation, Types of Dams (Earthen and Gravity Dam)

Term work:
Student can choose either Model A or Model B for performing practicalModel A
List of Experiments: Minimum 8 experiments should be performed from the following list-Practical exercises given be carried out and drawing sheets be plotted wherever necessary.
1. Introduction to Measurement of Distances.
2. Plotting the outlines of building by chaining, ranging and offsetting.

3. Plotting of closed traverse by prismatic compass.
4. Reduction of levels by rise and fall method.
5. Finding out gradient of line by rise and fall method
6. Measurement of area by mechanical
7. Study of total station for various measurements.
8. Site visit to study various construction processes and principles of planning.
9. Drawing sheet showing various building elements.
10. Drawing sheet showing various sign conventions

Model B
List of Experiments: Minimum 8 experiments should be performed from the following list-Practicalexercises given be carried out and drawing sheets be plotted wherever necessary.
1. Introduction to Measurement of Distances.
2. Plotting the outlines of building by chaining, ranging and offsetting.
3. Plotting of closed traverse by surveyor's compass.
4. Reduction of levels by collimation plane method.
5. Finding out gradient of line by collimation plane method.
6. Measurement of area by digital planimeter
7. Study of total station for various measurements.
8. Site visit to study various construction processes and principles of planning.
9. Drawing sheet showing various building elements.
10. Drawing sheet showing various sign conventions

Reference Books:
1. Basic Civil Engineering by S. S. Bhavikatti, New Age International Publications.
2. Civil Engineering Materials - Technical Teacher's Training Institute, Chandigarh
3. Surveying by N. Basak, Tata Mc-Graw Hill Publication.
4. Basic Civil Engineeringby G. K. Hiraskar, DhanpatRai Publication.
5. Surveying Vol.I, Vol.II, Vol.III by B.C. Punmia, Laxmi Publication.
6. Irrigation Engineering by B. C. Punmia, DhanpatRai Publications.

Sr. No	Sem.	Code No.	Subject	Credits
5	I	ESC-P-205	Engineering Graphics	4

CO`s:

At the end of this course, student will be able to
1. Draw engineering curves, loci of points and projections of lines and planes.
2. Visualize and draw the projection of regular solids, different cut models of regular solids.
3. Visualize, interpret and draw orthographic views from given pictorial view and Isometric view from given orthographic views.
4. Develop the lateral surfaces of various solids and understand its engineering.

Syllabus:

Course	Teaching Scheme					Evaluation Scheme				
						Theory(Marks)		Practical(Marks)		
	L	T	P	Credit	Scheme	Max.	Min. for Passing	Max.	Min. for Passing
Engineering Graphics	03	-	02	04	ISE	-	-	25	40%
					MSE	30	40%	-	-
					ESE	70	40%	-	-

ISE: In Semester Evaluation   MSE: Mid Semester Evaluation   ESE: End Semester Evaluation

SECTION I
Unit1: Fundamentals of Engineering Graphics& Engineering Curves   (6)
A) Fundamentals of Engineering Graphics: Introduction to Drawing instruments and their uses. Layout of drawing sheets, different types of lines used in drawing practice, Dimensioning system as per BIS (Theoretical treatment only)
B) Engineering curves: Construction of regular polygons (up to hexagon). Construction of Ellipse – (Directrix-Focus & Arcs of circle Method) Parabola-(Directrix-Focus & Rectangle Method) , Hyperbola-(Directrix-Focus & Rectangular Method), Involutes, Archimedian spiral and Cycloid only. (10 marks)

Unit 2: Projections of lines & Planes   (9)
A) Projections of lines: Introduction to First angle and third angle methods of projection.
Projections of points on regular reference planes. Projections of horizontal, frontal and Profile lines on regular and auxiliary reference planes. Projection of oblique lines it's True length and angle with reference planes by rotation and auxiliary plane method. Concept of grade and bearing

of line.

B) Projections of planes: Projections on regular and on auxiliary reference planes. Types of planes (horizontal, frontal, oblique and Profile planes). Edge view and True shape of a Plane. Angles made by the plane with Principle reference planes. Projections of plane figures inclined to both the planes. (Circleand regular polygon) (15 marks)

Unit 3: Projections of solids (5)
Projections of Prisms, Pyramids, Cylinder and Cones inclined to both reference planes(Excluding frustum and sphere)(10 marks)

SECTION- II
Unit 4: Orthographic Projections (7)
Orthographic views: lines used, Selection of views, spacing of views, dimensioning and sections. Drawing required views (any two views) from given pictorial views (Conversion of pictorial view into orthographic view) including sectional orthographic view. (15 marks)

Unit 5: Isometric projections (6)
Isometric projections: Introduction to isometric, Isometric scale, Isometric projections and Isometric views / drawings. Circles in isometric view. Isometric views of simple solids and objects. (10 marks)

Unit 6: Development of plane and curved surfaces (7)
Development of plane and curved surfaces: of the solids, Prisms, Pyramids, Cylinders and Cones along with cutting planes (Solids in simple position only). (10 marks)

Note: The above syllabus is to be covered according to the first angle method of projection.
Self-Study: Geometrical constructions and free hand sketches**,** Missing Views

Term work:
The following six sheets are to be drawn based on the above topics. All these sheets
shouldbe drawn on half imperial (A3 size) drawing sheets only.

1. Engineering curves   01
2. Projections of lines and planes   01
3. Projections of solids   01
4. Orthographic projections   01
5. Isometric projections   01
6. Sections of solids and development of surfaces   01

Reference Books:
1. Engineering Drawingby N. D. Bhatt, Charotor Publication House, Bombay
2. Fundamentals of Engineering by W. J. Luzadder, Drawing, Prentice Hall of India.
3. Engineering Design and Visualization by Jon M.Duff,William A. Ross, CENGAGE Learning
4. Machine Drawing by N. D. Bhatt, Charotor Publication House, Bombay.
5. Graphic Science by French and Vierck, Mc-Graw Hill International.
6. Engineering Drawing and Graphics by K. Venugopal, New Age Publication
7. A text book of Engineering Drawing by R. K. Dhawan, S. Chand and Co.
8. Machine Drawing by K. L. Narayana, New Age Publication
9. Engineering Drawing by N. B. Shaha and B. C. Rana, Pearson Education.
10. Engineering Drawing and Graphics Using AutoCAD by T. Jeyapoovan, Vikas Publication.
11. Engineering Drawing by Prof. Amar Pathak, WIELY India Publication.

Sr. No	Sem.	Code No.	Subject	Credits
6	I	HM-I-106	Professional Communication-I	2

COs:

At the end of this course, student will be able to:

1   Define various types of communications and to use effective communication by avoiding barriers.

2   Illustrate grammatically correct sentences and build vocabulary.

3   Demonstate the students the study of basic communication skills

Ex. Listening, Speaking,Reading and Writing skills and presentation skills.

4   Understand phonetics with repeated pronunciation practice for better fluency in communication.

5   Demonstrate the various types of business correspondence and to promote the formal letters.

Syllabus:

Course	Teaching Scheme					Evaluation Scheme			
						Theory(Marks)		Practical(Marks)	
	L	T	P	Credit	Scheme	Max.	Min. for Passing	Max.	Min. for Passing
Professional Communication-I	01	-	02	02	ISE	-	-	25	40%
					MSE	-	-	-	-
					ESE	-	-	-	-

ISE: In Semester Evaluation   MSE: Mid Semester Evaluation   ESE: End Semester Evaluation

Unit 1: Understanding Communication   (3)
1. Introduction, nature and importance
2. Process of communication
3. Basic types of communication- Verbal and Non- verbal
4. Barriers and filters of communication

Unit 2: Grammar and Vocabulary   (2)
1. Forms of Tenses
2. LSRW skills
3. Developing vocabulary (synonyms, antonyms, confused words etc.)

Unit 3: Phonetics   (2)

1. Understanding Phonetics and its alphabets
2. Transcription practices

Unit 4: Developing Oral Skills   (3)
1. Importance and techniques of spoken language.
2. Techniques of formal speech, meetings, Elocution, Extempore etc.

Unit 5: Professional Correspondence   (4)

1. Importance, language and style, formats (British & American)
2. Letter Writing – Simple letter (seeking permission regarding absence etc.),
3. Preparation of technical events information broacher and manuals.

Term Work: Minimum 8 should be performed from the following list.
1. Elocution
2. Vocabulary building
3. Phonetic Alphabets (Listen & repeat)
4. Pronunciation
5. Fluency Tips
6. Extempore
7. Teamwork- story making
8. Effective reading (newspaper articles)
9. Active listening (memorizing)
10. Letter writing
11. Situational conversation

Instructions:
1. Minimum 7 assignments should be covered.
2. Use of language lab is mandatory for both the semesters.

Reference Books:
1. Handbook for Technical Writingby David A. McMurrey, Joanne Buckley, Cengage.
2. A Course in Englishby J.D. O'Connor.
3. Better English Pronunciation by J.D. O'Connor.
4. Communication Skills Handbook: How to succeed in written and oral communication by JaneSummers, Brette Smith, Wiley India Pvt.Ltd.
5. Personal Development for Life and Work by Masters, Wallace, Cengage.
6. Soft Skills for Managers by Dr. T. Kalyana Chakravarthi, Dr. T. LathaChakravarthi, Biztantra.
7. Soft Skills for every one by Jeff Butterfield, Cengage.
8. Behavioural Science by Dr.Abha Singh, Wiley India Pvt.Ltd.
9. An Introduction to Professional English and Soft Skills by Bikram K. Das, Kalyani Samantray,Cambridge University Press New Delhi.
10. Speaking Accurately, K.C. Nambiar, Cambridge University Press New Delhi.
11. Speaking Effectivelyby Jeremy Comfort, Pamela Rogerson, Cambridge University Press New Delhi.
12. Cambridge English for Job Hunting by ColmDownes, Cambridge University Press New Delhi.
13. Body Language by Allen Pease.
14. The Ace of Soft Skills by Gopalswami Ramesh, Mahadevan Ramesh, Pearson Publication, Delhi.
15. Decision Making Skills by Khanka S.S.
16. Business Ethics and Communication by C.S. TejpalSheth.
17. Write Right by Syed AbdurRaheem.

Sr. No	Sem.	Code No.	Subject	Credits
7	I	ESC-W-I-107	Workshop Practice-I	2

COs:

At the end of this course, student will be able to:

1 Understand the Basics of Workshop practices with safe handling of machines and tools.
2 Impart knowledge and skill to use tools, machines, equipment, and measuring instruments.
3 Acquire knowledge of carrying out various operations in mechanical engineering workshop
4 Apply the techniques for performing basic operations with hand tools for smithy and fitting models

Syllabus:

Course	Teaching Scheme					Evaluation Scheme			
						Theory(Marks)		Practical(Marks)	
	L	T	P	Credit	Scheme	Max.	Min. for Passing	Max.	Min. for Passing
Workshop Practice-I	01	-	02	02	ISE	-	-	25	40%
					MSE	-	-	-	-
					ESE	-	-	-	-

ISE: In Semester Evaluation   MSE: Mid Semester Evaluation   ESE: End Semester Evaluation

Unit 1: Safety (3)
Concept of accidents, causes of accidents, safety precautions while working in shop, safetyequipmentsand their use.

Unit 2: Measuring Instruments (3)
Brief introduction to instruments like – Steel rule, Calipers, Vernier Caliper, Micrometer, DialGauge,Vernier height Gauge etc. Least counts, common errors and care while using them, Use ofmarkinggauge, 'V'block and surface plate.

Unit 3: Smithy (4)
Introduction to smithy operations like- bending, forming, upsetting, drawing. Smithy toolshammer,hot &cold chisel flatters, tongs, anvil etc.

Unit 4: Fitting (4)
Study of various tools like- files, drills, taps, dies. Fitting operations.

Term work:

The term work consists of assignment on safety, measuring instruments, Smithy and fitting.Every student should perform,

1. Smithy
One job in smithy involving upsetting, Drawing, bending such as- Hook, peg, square headedbolt etc.

2. Fitting

One job Male/Female fitting with operations- Marking, cutting, drilling, tapping filing etc.

Reference Books:
1. A Course in Workshop Technology, Vol – I by B. S. Raghuvanshi, Dhanapat Rai and Sons.
2. Elements of Workshop Technology, Vol – I by HajaraChaudhari, Media Promoters.
3. Workshop Technology, Vol – I by Gupta and Kaushik, New Heights.
4. Workshop Technology, Vol – I by Chapman, The English Language Book Society.
5. Workshop Technology, Vol.-I by H.S. Bawa, TMH Publications, New Delhi.

Chemistry Group			
Sr. No	**Code No.**	**Subject**	**Credits**
1.	BSC-C-101	Engineering Chemistry	4
2.	BSC-M-I-102	Engineering Mathematics-I	4
3.	ESC-C-103	Fundamentals of Electronics and Computer Programming	4
4.	ESC-C-104	Applied Mechanics	4
5.	ESC-C-105	Basic Mechanical Engineering	4
6.	HM-I-106	Professional Communication-I	2
7.	ESC-W-I-107	Workshop Practice-I	2
		Total	24

Sr. No	**Sem.**	**Code No.**	**Subject**	**Credits**
1	I	BSC-C-101	Engineering Chemistry	4

Cos:

At the end of this course, student will be able to:

1. To acquire and apply basic knowledge of chemistry in technical fields.

2. Bring adaptability to new developments in engineering chemistry and to acquire the skils required to become a perfect engineer.

3. To integrate your chemistry principles and fundamentals with engineering applications**.**

Syllabus:

Course	Teaching Scheme					Evaluation Scheme			
						Theory(Marks)		Practical(Marks)	
	L	**T**	**P**	**Credit**	**Scheme**	**Max.**	**Min. for Passing**	**Max.**	**Min. for passing**
Engineering Chemistry	03	-	01	04	ISE	-	-	25	40%
					MSE	30	40%	-	-
					ESE	70	40%	-	-

ISE: In Semester Evaluation   MSE: Mid Semester Evaluation   ESE: End Semester Evaluation

SECTION I

Unit 1: Water (7)

Introduction, impurities in natural water, water quality parameters total solids, acidity, alkalinity, chlorides, and dissolved oxygen (definition, causes, significance), hardness of water types of hardness, units of hardness, ill effects of hard water in steam generation in boilers (scale & sludge formation), numerical on hardness, treatment of hard water (ion exchange and reverse osmosis).

Unit 2: Instrumental methods of chemical analysis (7)

Introduction, advantages and disadvantages of instrumental methods-----

A) Spectrometry: Introduction, Laws of spectrometry (Lamberts and Beer-Lambert's law),Single beamspectrophotometer (schematic, working and applications).

B) Chromatography: Introduction, types, gas-liquid chromatography (GLC), basic principle,instrumentation and applications.

Unit 3: Advanced materials (7)

A) Polymers: Introduction, plastics, thermo softening and thermosetting plastics, industrially important plastics like phenol formaldehyde, urea formaldehyde and epoxy resins, Conducting polymers andBiopolymers(Introduction, examples and applications.)

B) Composite materials: Introduction, Composition, properties and uses of fiber reinforced plastics (FRP) and glass reinforced plastic (GRP).

SECTION II

Unit 4: Fuels(7)

Introduction, classification, calorific value, definition, units (calorie, kcal, joules, kilojoules), characteristics of good fuels, comparison between solid, liquid and gaseous fuels, types of calorific value (higher and lower), Bomb calorimeter and Boy's calorimeter. Numericalproblems on Bomb and Boy's calorimeter.

Unit.5: Corrosion: (7)

Introduction, causes, classification, atmospheric corrosion (oxidation corrosion), electrochemical corrosion (hydrogen evolution and oxygen absorption mechanism), factors affecting rate of corrosion. Prevention of corrosion by proper design and material selection,cathodic protection, Protective coatings-hot dipping (galvanizing and tinning,), electroplating.

Unit 6: Metallic materials & Green Chemistry (7)

A) Metallic materials: Introduction, Alloy- definition and classification, purposes of making alloys. Ferrous alloys: Plain carbon steels (mild, medium and high), stainless steels. Nonferrous alloys: Copper alloy (Brass), Nickel alloy (Nichrome), Aluminum alloy (Duralumin and Alnico).

B) Green Chemistry: Definition, Twelve principles of Green Chemistry.

Term work:

List of Experiments:

Minimum 8 experiments should be performed from the following list out of which two experiments should be demonstrative on instrumental methods.

1. Determination of acidity of water.
2. Determination of alkalinity of water.
3. Determination of chloride content of water by Mohr's method.
4. Determination of total hardness of water by EDTA method.

5. Determination of moisture, volatile and ash content in a given coal sample by proximateanalysis.
6. Preparation of urea-formaldehyde resin.
7. Preparation of phenol-formaldehyde resin.
8. Determination of percentage of copper in brass.
9. Estimation of zinc in brass solution.
10. Determination of rate of corrosion of aluminium in acidic and basic medium.
11. Demonstration of pH meter.
12. Demonstration of photo-colorimeter / spectrophotometer.
13. Demonstration of paper chromatography.

Reference books:
1. Engineering Chemistry by Jain and Jain, Dhanpat Rai Publishing Company Ltd., New Delhi.
2. A Textbook of Engineering Chemistry by S. S. Dara and S. S. Umare, S. Chand & Company Ltd.,New Delhi.
3. A Textbook of Engineering Chemistry by C. P. Murthy, C. V. Agarwal and A. Naidu, BSPublications, Hyderabad.
4. Chatwal and Anand, Instrumental Methods of Chemical Analysis, Himalaya Publishing House, NewDelhi.
5. Engineering Chemistry by Dr. A. K. Pahari and Dr. B. S. Chauhan, Laxmi Publications (P) Ltd, NewDelhi.
6. A text Book of Engineering Chemistry by ShashiChawla, DhanpatRai& Co. (Pvt.) Ltd, Delhi.7.Engineering Chemistry by Wiley India.
8. Engineering Chemistry by RenuBapna and Renu Gupta, MacMillan Publishers (India) Ltd, Delhi.

Sr. No	Sem.	Code No.	Subject	Credits
2	I	BSC-M-I-102	Engineering Mathematics-I	4

COs:
At the end of this course, student will be able to:
1. Apply the knowledge of matrices to find rank, solutions of Simultaneous Linear Equations
2. Use the knowledge of matrices to find Eigen values & Eigen vectors.
3. Find the roots of Complex numbers and use in engineering applications
4. Solve the Simultaneous Linear Equations numerically and apply in engineering applications
5. Understand the concept of limits and expansion of functions.
6. Use knowledge of derivative for Partial differentiation & its applications.

Syllabus:

Course	Teaching Scheme					Evaluation Scheme			
						Theory(Marks)		Practical(Marks)	
	L	T	P	Credit	Scheme	Max.	Min. for Passing	Max.	Min. for Passing
Engineering Mathematics-I	03	1	-	04	ISE	-	-	25	40%
					MSE	30	40%	-	-
					ESE	70	40%	-	-

ISE: In Semester Evaluation   MSE: Mid Semester Evaluation   ESE: End Semester Evaluation

SECTION I
Unit 1: Matrices and Solution of Linear System Equations(8)
(Weightage 15 Marks in Shivaji Uni Exam of 70 marks)
1 Rank of matrix: definition, normal form and echelon form
2 Consistency of linear system equations
3 System of linear homogeneous equations
4 System of linear Non-homogeneous equations

Unit 2: Eigen Values and Eigen vectors(7)
(Weightage 10 Marks in Shivaji Uni Exam of 70 marks)
1 Eigen Values
2 Properties of Eigen Values
3 Eigen vectors
4 Properties of Eigen vectors
5 Cayley-Hamilton's theorem (Without proof)

Unit 3: Complex Numbers   (6)
(Weightage 10 Marks in Shivaji Uni Exam of 70 marks)
1 De Moivre's Theorem (Without proof)
2 Roots of complex numbers by using De Moivre's Theorem
3 Expansion of $\sin n\theta$ and $\cos n\theta$ in powers of $\sin\theta$ and /or $\cos\theta$.
4 Circular functions of a complex variable – definitions
5 Hyperbolic and Inverse Hyperbolic Functions- definitions

SECTION II
Unit 4: Numerical Solution of linear simultaneous equations: (6)
(Weightage 10 Marks in ShivajiUni Exam of 70 marks)
1 Gauss elimination method
2 Gauss-Jordan method
3 Jacobi's iteration method
4 Gauss-Seidel iteration method

Unit 5: Expansion of Functions and Indeterminate forms: (7)
(Weightage 10 Marks in Shivaji UniExam of 70 marks)
1 Maclaurin's theorem
2 Standard expansions
3 Taylor's theorem
4 Indeterminate forms and L' Hospital's rule

Unit 6: Partial Differentiation:(8)(Weightage 15 Marks in Shivaji Uni Exam of 70 marks)
1 Partial derivatives: Introduction
2 Total derivatives
3 Differentiation of implicit function
4 Euler's theorem on homogeneous function of two variables
5 Jacobian and its Properties .
6 Maxima and Minima of functions of two variables

General Instructions:

1. Batch wise tutorials are to be conducted. The number of students per batch should be as perthe university pattern for practical batches.
2. Minimum number of assignments should be 8 covering all topics.

Recommended Books:
1. A text book of Applied Mathematics, Vol.I by P. N. Wartikar& J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
2. Higher Engineering Mathematics by Dr. B. S. Grewal, Khanna Publishers, Delhi.

Reference Books:
1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley India Pvt. Ltd.
2. Advanced Engineering Mathematics by H. K. Dass, S. Chand, New Delhi.
3. A text book of Engineering Mathematics Volume I by Peter V. O'Neil and Santosh K.Sengar,Cengage Learning.
4. Mathematical methods of Science and Engineering by Kanti B. Datta, Cengage Learning.
5. Numerical methods by Dr. B. S. Grewal, Khanna Publishers, Delhi.
6. A text book of Engineering Mathematics by N. P. Bali, Iyengar, Laxmi Publications (P) Ltd.,NewDelhi.

Sr. No	Sem.	Code No.	Subject	Credits
3	I	ESC-C-103	Fundamentals of Electronics and Computer Programming	4

Co`s:
At the end of this course, student will be able to:

1) Choose appropriate components to design basic circuit in electronics engineering.
2) Construct the digital circuit using Boolean laws.
3) Identify transducers as per application and describe functioning of several electronic appliances.
4) Explain complete computer hardware and its peripheral.
5) Outline of Operating System Features, Types and Explain the System Software's and data representation in computer.
6) Recognize and explain the Computer Networks and programming techniques.

Syllabus:

Course	Teaching Scheme					Evaluation Scheme			
						Theory(Marks)		Practical(Marks)	
	L	T	P	Credit	Scheme	Max.	Min. for Passing	Max.	Min. for passing
Fundamentals of Electronics and Computer Programming	03	-	02	04	ISE	-	-	25	40%
					MSE	30	40%	-	-
					ESE	70	40%	-	-

ISE: In Semester Evaluation   MSE: Mid Semester Evaluation   ESE: End Semester Evaluation

Semester -I and II
SECTION I

Unit 1: Semiconductor Devices and Applications (7)

(Weightage 12 Marks in Shivaji Uni Exam of 70 marks)

Semiconductor Diode, Half wave, Full wave, Bridge rectifier, Voltage Regulator Using Zener Diode,BJT: characteristics, CE configuration, CE as an amplifier. Load Line, Operating Point, Leakage Currents, Saturation and Cut off Mode of Operations.

Unit 2: Digital Electronics (7)

(Weightage 11 Marks in Shivaji Uni Exam of 70 marks)

Logic Gates, Boolean algebra, Comparison of Specifications of Logic Families, Combinational Logic,Half Adder, Full Adder, Multiplexer, De-Multiplexer.

Unit 3: Applications (7)

(Weightage 12 Marks in Shivaji Uni Exam of 70 marks)

A) Transducers: for Displacement (LVDT), Temperature (RTD), Pressure (Strain Gauge), Speed (ShaftEncoder), Range, Specifications and Limitations.

B) Appliances: Operation of Appliances: Digital Thermometer, Weighing Machine, Washing Machine,Microwave Oven and Tachometer.

SECTION II

Unit 4: Computer Basics and Hardware (5)

(Weightage 12 Marks in Shivaji Uni Exam of 70 marks)

A) Generations & Classification of Computers.

B) Computer System Architecture– CPU, Input Unit, Output Unit, Storage Unit.

C) Applications of Computers.

Unit 5: Data Representation and Computer Software (8)

(Weightage 11 Marks in Shivaji Uni Exam of 70 marks)

A) Data Representation In Computer: Types Of Number System – Binary, Octal, Decimal, Hexadecimal & Their Conversions, Coding Schemes – ASCII, Unicode.

B) Computer Software:

A) Operating System: Types Of Operating System, Functions, Unix/Linux Commands: Listing,Changing, Copying, And Moving Files & Directories (ls, cd, cat, mkdir, rmdir)

B) System Software: Assembler, Interpreter, Compiler.

C) Application Software's: Word Processor, Spreadsheets, Presentation andtheir Applications.

Unit 6: Computer Programming and Networks   **(8)**

     (Weightage 12 Marks in Shivaji Uni Exam of 70 marks)

A) Computer Programming: Program Development Cycle, Algorithm,

     Flowchart,Programming Control Structures – Sequence, Selection, and

     Repetition.

B) Introduction to Computer Networks: Definition Of Computer Network, Need,

     Standards: OSI,TCP/IP, Types of Networks: LAN, WAN, MAN, Network Topologies.

Term work: FUNDAMENTAL OF ELECTRONICS

List of Experiments: Minimum 4 experiments should be performed from the following list.

1. Testing of Electronic components- resistors, capacitors, inductor, diode, transistor,
   LED andSwitches using multi-meter &C.R.O.
2. V-I Characteristics of PN junction diode and Zener diode.
3. Study of Half and Full wave rectifiers and their comparison.
4. Study of Frequency response of CE amplifier.
5. Study of truth tables of logic Gates: OR, AND, NOT, NAND, NOR, EXOR.
6. Study of MUX/DEMUX.
7. Measurement of Displacement using LVDT/strain Gauge.
8. Measurement of Temperature using any transducer.

Self-Learning Activities: Different types of Communication systems & Communication Media.

Term work: FUNDAMENTAL OF COMPUTER

List of Experiments: Minimum 4 experiments should be performed from the following list.

1. Study of computer system – Internal Components & peripherals.
2. Use of Unix/Linux commands & create a file using any editor in Linux.
3. Create a document using any word processor (In Linux (open office) /Windows (Microsoft office).
4. Use any spreadsheet application to manipulate numbers, formulae and graphs (In Linux/Windows).
5. Use any power point presentation application and create a professional power point
   presentation using text, image, animation etc. (In Linux/Windows).
6. An assignment based on use of Internet and Web for searching and downloading Technical
   information.
7. Study of Tablet and Android Operating System Features and applications.

Text Books:

1. A Text Book of Applied Electronics by R S Sedha, S. Chand

2. Basic Electronics Engineering by Vijay Baru, RajendraKaduskar, S T Gaikwad (Wiley/DREAMTECH)

3. Digital Principles & Applications by Albert Malvino, Donald Leach, TMGH Publication.

4. Principle of Electronics by V.K. Mehata, S. Chand

5. Electronic Instrumentation by H. S. Kalasi, Tata McGraw Hills Publication

Reference Books:

1) Electronics Devices and Circuit Theory by Robert L. Boylestad and Louis Nashelsky (PearsonEducation Publication)

2) Fundamental of Digital Circuits by A. Anand Kumar (PHI- Publication)

3) Fundamental of Electronics Engineering by R.Prasad(CENGAGE- Learning)

4) Introduction to Information Technology, ITL Education Solutions LTD. Pearson Education

5) Fundamentals of Computers by V. Rajaram, PHI Publications.

6) UNIX concepts and applications by Sunitabha Das, TMGH.

7) Computer Fundamentals Architecture and Organization by B.Ram New Age International Publishers.

Sr. No	Sem.	Code No.	Subject	Credits
4	I	ESC-C-104	Applied Mechanics	4

COs:

At the end of successful completion of course, the student will be able to-

1. Find the resultant and locate it from any point for any given structures
2. Compute the support reactions for any given beam
3. Explain geometric properties of plain lamina and solve it for Moment of Inertia.
4. Solve the problems on kinetics of linear and circular motions & explain the effect of impact loads on various bodies.

Syllabus:

| Course | Teaching Scheme | | | | Evaluation Scheme | | | | |
| | L | T | P | Credit | Scheme | Theory(Marks) | | Practical(Marks) | |
						Max.	Min. for Passing	Max.	Min. for passing
Applied Mechanics	03	-	02	04	ISE	-	-	25	40%
					MSE	30	40%	-	-
					ESE	70	40%	-	-

ISE: In Semester Evaluation   MSE: Mid Semester Evaluation   ESE: End Semester Evaluation

SECTION I

Unit 1: Fundamentals of Statics **(7)**
Basic Concepts and Fundamental Laws, Force, Moment and Couple, System of Forces,Resultant, Resolution and Composition of Forces, Varignon's Theorem, Law of Moments.

Unit 2: Equilibrium **(7)**
Lami s' Theorem, Free Body Diagram, Equilibrium of Forces, Equilibrium conditions, Surfacefriction for bodies on horizontal and inclined planes.
Beams: Types of Loads, Types of supports, Analysisof Simple beams, Virtual work method forsupport reactions.

Unit 3: Centroid and Moment of Inertia **(7)**
Centroid and Center of Gravity, Moment of Inertia of Standard shapes from first principle, Parallel and perpendicular axis theorem, Moment of Inertia of plain and composite figures, Radius of Gyration.

SECTION II

Unit 4: Kinetics of Linear **(8)**
Introduction to Kinematics of Linear motion (no numerical on kinematics), Kinetics of linear motion, Newton's Laws, D'Alembert's Principle, Work- Energy Principle, Impulse Momentum Principal

Unit 5: Kinetics of Circular Motion **(8)**
Introduction to Kinematics of Circular motion (no numerical on kinematics), Rotation with constant and variable angular acceleration, centripetal and centrifugal force, condition of skidding and overturning.

Unit 6: Impact and Collision **(5)**
Impact, Types of Impact, Law of conservation of Momentum, Coefficient of Restitution,Numerical on Direct central Impact.

Term work:
   Student can choose either Model 1 or Model 2 for performing practical

Model 1	Model 2

A) Experiments:	
1. Law of polygon of forces	**1.** Law of polygon of forces
2. Jib crane	**2.** Jib crane
3. Bell crank lever	**3.** Bell crank lever
4. Support Reactions of Beam	**4.** Support Reactions of Beam
5.Fleture's Trolley	**5.** Centrifugal force
B) Graphics Statics: (To be solved on A3 sheet)	
1. To find Resultant - 3 problems	1. To find Resultant - 3 problems
2.To find support reactions - 3 problems	**2.**To find support reactions - 3 problems
C) Home Assignments	
At least one assignment on each unitwith minimum 5 numericals	At least one assignment on each unitwith minimum 5 numericals

Reference Books:
1. Engineering Mechanics by S. S. Bhavikattis, New Age International Pvt. Ltd.
2. 2.Engineering Mechanics by R. K. Bansal and Sanjay Bansal.
3. Vector Mechanics for Engineers Vol.I and II by F. P. Beer and E. R. Johnston, Tata Mc-Graw Hill Publication.
4. Engineering Mechanics by Manoj K Harbola, Cengage Learning
5. Engineering Mechanics by K. I. Kumar, Tata Mc-Graw Hill Publication
6. Engineering Mechanics by S. B. Junnerkar.
7. Engineering Mechanics by Irving H. Shames, Prentice Hall of India, New Delhi.
8. Applied Mechanics by S. N. Saluja, Satya Prakashan, New Delhi.
9. Engineering Mechanics by Statics and Dynamics by Ferdinand Singer, Harper and RowPublications
10. Engineering Mechanics by R. S. Khurmi, S. Chand Publications
11. Fundamentals of Engineering Mechanics by S. Rajasekaran, G. Sankarasubramanian, Vikas Publishing House
12. "Applied Mechanics- Dynamics &Statics " by I.B.Prasad, Khanna Publisher, Delhi

Sr. No	Sem.	Code No.	Subject	Credits
5	I	ESC-C-105	Basic Mechanical Engineering	4

CO`s:
At the end of successul completion of course, the students should able to-
1. Explain basics of thermodynamics , thermodynamics laws and apply first law of thermodynamics for steady flow process.
2. Classify and demonstrate the heat engines, like I.C.Engines , Refrigeration systems,Air conditioning and different air standered cycles.
3. Explain different energy sources and construction,working of different types of power plants and solar collectors.
4. Demonstrate and select mechanical power transmission and energy conversion devices as well as manufacturing processes.

Syllabus:

Course	Teaching Scheme					Evaluation Scheme			
						Theory(Marks)		Practical(Marks)	
	L	T	P	Credit	Scheme	Max.	Min. for Passing	Max.	Min. for passing
Basic Mechanical Engineering	03	-	02	04	ISE	-	-	25	40%
					MSE	30	40%	-	-
					ESE	70	40%	-	-

ISE: In Semester Evaluation   MSE: Mid Semester Evaluation   ESE: End Semester Evaluation

Semester -I

Unit1:Thermodynamics(7)
Thermodynamic State, Process, Cycle, Thermodynamic System, Heat, work, Internal Energy,First Law of Thermodynamics, Application of First Law to steady Flow processes,Limitations of First Law(Numerical Treatment) Statements of Second Law of Thermodynamics.(12 marks)

Unit 2: Introduction to I C Engine (7)
Carnot Engine, Construction and Working of C.I. and S.I., Two stroke, Four Stroke Cycles,Air standard cycles- Carnot Cycle, Joule Cycle, Otto Cycle, Air Standard efficiency (DescriptiveTreatment only) (12 marks)

Unit 3: Introduction to Refrigeration and Air Conditioning (6)
Carnot refrigerator, Refrigerant types and properties, Vapour compression and vapour absorption system, solar refrigeration, Window Air Conditioning, Psychometric properties of moist air, Applications of refrigeration and air conditioning (Descriptive Treatment only).(11 marks)

Unit4:EnergySources and power plants (7)
Renewable and nonrenewable, Solar-flat plate collector, concentric collector–Parabolic and cylindrical, Photovoltaic cell, Wind, Hydropower plant, Steam Power plant, Bio-gas, Bio-Diesel (Descriptive Treatment only). (12 marks)

Unit 5: Mechanical Power Transmission and Energy conversion devices(7)
Type of Belt and belt drives, chain drive, Types of gears and gear Trains, (Numerical Treatment on beltdrive), Construction, working and applications of centrifugal Pump, Reciprocating compressor and Peloton wheel Turbine.(12 marks)

Unit 6: Manufacturing Processes   (6)
Introduction to manufacturing processes - Casting Process, Steps involved in casting processes, and their applications, Metal removing processes (Lathe, milling & drilling operations) Metal Joining Processes – Arc welding, soldering and brazing and their applications.(11 marks)

Term Work:
List of experiments: Minimum 8 experiments should be performed from the following list--

1. Demonstration of I.C. engine
2. Demonstration of Two stroke and four stroke engine
3. Demonstration of vapor compression refrigeration system and window airconditioner.
4. Demonstration of Solar water heating system.
5. Demonstration of Steam or Hydroelectric Power Plant
6. Demonstration of Diesel power plant
7. Demonstration of types of Gears and gear trains.
8. Demonstration of pumps and compressor.
9. Demonstration of hydraulic turbine
10. Demonstration of metal joining processes.
11. Demonstration of metal removal processes.
12. Industrial visit based on syllabus.

Reference Books:
1. Solar Energy by Dr.S.P. Sukathame,Tata Mc-Graw Hill Publication
2. Non-Conventional Sources of Energy by G.D. Rai, Khanna Publication
3. Engineering Thermodynamics by R.Joel, The English Language Book Society.
4. Engineering Thermodynamics by Achultan, Prentice Hall of India.
5. Thermal Engineering by R.K. Rajput, Laxmi Publication, Delhi.
6. Elements of Heat Engine Vol.I,II,III by Patel and Karamchandani, Acharya Book Depot.
7. Power Plant Engineering by Arora and Domkunwar, Dhanpat Rai and Sons.
8. Manufacturing Technology Volume I and II by P. N. Rao, Tata Mc-Graw Hill Publication
9. Elements of Workshop Technology, Vol.I and II by HajaraChoudhari, Media Promoters
10. Basic Mechanical Engineering by Basant Agrawal & C. M. Agrwal, Wiley India Pvt. Ltd.11.Energy Technology by S. Rao and Dr.B.B. Parulekar, Khanna Publication.

Sr. No	Sem.	Code No.	Subject	Credits
6	I	HM-I-106	Professional Communication-I	2

COs:

1 Define various types of communications and to use effective communication by avoiding barriers.

2 Illustrate grammatically correct sentences and build vocabulary.

3 Demonstate the students the study of basic communication skills

Ex. Listening, Speaking,Reading and Writing skills and presentation skills.

4 Understand phonetics with repeated pronunciation practice for better fluency in communication.

5 Demonstrate the various types of business correspondence and to promote the formal letters.

Syllabus:

Course	L	T	P	Credit	Scheme	Theory(Marks) Max.	Theory(Marks) Min. for Passing	Practical(Marks) Max.	Practical(Marks) Min. for Passing
Professional Communication-I	01	-	02	02	ISE	-	-	25	40%
					MSE	-	-	-	-
					ESE	-	-	-	-

ISE: In Semester Evaluation   MSE: Mid Semester Evaluation   ESE: End Semester Evaluation

Unit 1: Understanding Communication (3)
1 Introduction, nature and importance
2 Process of communication
3 Basic types of communication- Verbal and Non- verbal
4 Barriers and filters of communication

Unit 2: Grammar and Vocabulary (2)
1 Forms of Tenses
2 LSRW skills
3 Developing vocabulary (synonyms, antonyms, confused words etc.)

Unit 3: Phonetics (2)

1 Understanding Phonetics and its alphabets
2 Transcription practices

Unit 4: Developing Oral Skills (3)
1 Importance and techniques of spoken language.
2 Techniques of formal speech, meetings, Elocution, Extempore etc.

Unit 5: Professional Correspondence (4)

1 Importance, language and style, formats (British & American)
2 Letter Writing – Simple letter (seeking permission regarding absence etc.),
3 Preparation of technical events information broacher and manuals.

Term Work: Minimum 8 should be performed from the following list.
1   Elocution
2   Vocabulary building
3 Phonetic Alphabets (Listen & repeat)
4 Pronunciation
5 Fluency Tips
6 Extempore
7 Teamwork- story making
8 Effective reading (newspaper articles)
9 Active listening (memorizing)
10 Letter writing
11 Situational conversation

Instructions:
1 Minimum 7 assignments should be covered.
2 Use of language lab is mandatory for both the semesters.

Reference Books:
1 Handbook for Technical Writingby David A. McMurrey, Joanne Buckley, Cengage.
2 A Course in Englishby J.D. O'Connor.
3 Better English Pronunciation by J.D. O'Connor.

4 Communication Skills Handbook: How to succeed in written and oral communication by JaneSummers, Brette Smith, Wiley India Pvt.Ltd.
5 Personal Development for Life and Work by Masters, Wallace, Cengage.
6 Soft Skills for Managers by Dr. T. Kalyana Chakravarthi, Dr. T. LathaChakravarthi, Biztantra.
7 Soft Skills for every one by Jeff Butterfield, Cengage.
8 Behavioural Science by Dr.Abha Singh, Wiley India Pvt.Ltd.
9 An Introduction to Professional English and Soft Skills by Bikram K. Das, Kalyani Samantray,Cambridge University Press New Delhi.
10 Speaking Accurately, K.C. Nambiar, Cambridge University Press New Delhi.
11 Speaking Effectivelyby Jeremy Comfort, Pamela Rogerson, Cambridge University Press New Delhi.
12 Cambridge English for Job Hunting by ColmDownes, Cambridge University Press New Delhi.
13 Body Language by Allen Pease.
14 The Ace of Soft Skills by Gopalswami Ramesh, Mahadevan Ramesh, Pearson Publication, Delhi.
15 Decision Making Skills by Khanka S.S.
16 Business Ethics and Communication by C.S. TejpalSheth.
17 Write Right by Syed AbdurRaheem.

Sr. No	Sem.	Code No.	Subject	Credits
7	I	ESC-W-I-107	Workshop Practice-I	2

COs:
At the end of this course, student will be able to:
5 Understand the Basics of Workshop practices with safe handling of machines and tools.
6 Impart knowledge and skill to use tools, machines, equipment, and measuring instruments.
7 Acquire knowledge of carrying out various operations in mechanical engineering workshop
8 Apply the techniques for performing basic operations with hand tools for smithy and fitting models

Syllabus:

Course	Teaching Scheme					Evaluation Scheme			
						Theory(Marks)		Practical(Marks)	
	L	T	P	Credit	Scheme	Max.	Min. for Passing	Max.	Min. for Passing
Workshop Practice-I	01	-	02	02	ISE	-	-	25	40%
					MSE	-	-	-	-
					ESE	-	-	-	-

ISE: In Semester Evaluation   MSE: Mid Semester Evaluation   ESE: End Semester Evaluation

Unit 1: Safety (3)
Concept of accidents, causes of accidents, safety precautions while working in shop, safety equipments and their use.

Unit 2: Measuring Instruments (3)

Brief introduction to instruments like – Steel rule, Calipers, Vernier Caliper, Micrometer, Dial Gauge, Vernier height Gauge etc. Least counts, common errors and care while using them, Use of marking gauge, 'V' block and surface plate.

Unit 3: Smithy (4)
Introduction to smithy operations like- bending, forming, upsetting, drawing. Smithy tools hammer, hot &cold chisel flatters, tongs, anvil etc.

Unit 4: Fitting (4)
Study of various tools like- files, drills, taps, dies. Fitting operations.

Term work:

The term work consists of assignment on safety, measuring instruments, Smithy and fitting.Every student should perform,

3. Smithy
One job in smithy involving upsetting, Drawing, bending such as- Hook, peg, square headedbolt etc.

4. Fitting
One job Male/Female fitting with operations- Marking, cutting, drilling, tapping filing etc.

Reference Books:
1 A Course in Workshop Technology, Vol – I by B. S. Raghuvanshi, Dhanapat Rai and Sons.
2 Elements of Workshop Technology, Vol – I by HajaraChaudhari, Media Promoters.
3 Workshop Technology, Vol – I by Gupta and Kaushik, New Heights.
4 Workshop Technology, Vol – I by Chapman, The English Language Book Society.
5 Workshop Technology, Vol.-I by H.S. Bawa, TMH Publications, New Delhi.

		Chemistry Group	
Sr. No	**Code No.**	**Subject**	**Credits**
1.	BSC-C-201	Engineering Chemistry	4
2.	BSC-M-II-202	Engineering Mathematics-II	4
3.	ESC-C203	Fundamentals of Electronics and Computer Programming	4
4.	ESC-C204	Applied Mechanics	4
5.	ESC-C205	Basic Mechanical Engineering	4
6.	HM-II-206	Professional Communication-II	2
7.	ESC-W-II-207	Workshop Practice-II	2
		Total	24

Sr. No	**Sem.**	**Code No.**	**Subject**	**Credits**
1	II	BSC-C-201	Engineering Chemistry	4

Cos:

At the end of this course, student will be able to:

1 To acquire and apply basic knowledge of chemistry in technical fields.

2 Bring adaptability to new developments in engineering chemistry and to acquire the skills required to become a perfect engineer.

3 To integrate your chemistry principles and fundamentals with engineering applications.

Syllabus:

Course	**Teaching Scheme**					**Evaluation Scheme**			
						Theory(Marks)		**Practical(Marks)**	
	L	**T**	**P**	**Credit**	**Scheme**	**Max.**	**Min. for Passing**	**Max.**	**Min. for passing**
Engineering Chemistry	03	-	01	04	ISE	-	-	25	40%
					MSE	30	40%	-	-
					ESE	70	40%	-	-

ISE: In Semester Evaluation   MSE: Mid Semester Evaluation   ESE: End Semester Evaluation

SECTION I

Unit 1: Water (7)

Introduction, impurities in natural water, water quality parameters total solids, acidity, alkalinity, chlorides, and dissolved oxygen (definition, causes, significance), hardness of water types of hardness, units of hardness, ill effects of hard water in steam generation in boilers (scale & sludge formation), numerical on hardness, treatment of hard water (ion exchange and

reverse osmosis).

Unit 2: Instrumental methods of chemical analysis (7)

Introduction, advantages and disadvantages of instrumental methods-----

C) Spectrometry: Introduction, Laws of spectrometry (Lamberts and Beer-Lambert's law),Single beamspectrophotometer (schematic, working and applications).

D) Chromatography: Introduction, types, gas-liquid chromatography (GLC), basic principle,instrumentation and applications.

Unit 3: Advanced materials (7)

C) Polymers: Introduction, plastics, thermo softening and thermosetting plastics, industrially important plastics like phenol formaldehyde, urea formaldehyde and epoxy resins, Conducting polymers andBiopolymers(Introduction, examples and applications.)

D) Composite materials: Introduction, Composition, properties and uses of fiber reinforced plastics (FRP) and glass reinforced plastic (GRP).

SECTION II

Unit 4: Fuels(7)

Introduction, classification, calorific value, definition, units (calorie, kcal, joules, kilojoules), characteristics of good fuels, comparison between solid, liquid and gaseous fuels, types of calorificvalue (higher and lower), Bomb calorimeter and Boy's calorimeter. Numericalproblems on Bomb and Boy's calorimeter.

Unit.5: Corrosion: (7)

Introduction, causes, classification, atmospheric corrosion (oxidation corrosion), electrochemical corrosion (hydrogen evolution and oxygen absorption mechanism), factors affecting rate of corrosion. Prevention of corrosion by proper design and material selection,cathodic protection, Protective coatings-hot dipping (galvanizing and tinning,), electroplating.

Unit 6: Metallic materials & Green Chemistry (7)

C) Metallic materials: Introduction, Alloy- definition and classification, purposes of making alloys. Ferrous alloys: Plain carbon steels (mild, medium and high), stainless steels. Nonferrous alloys: Copper alloy (Brass), Nickel alloy (Nichrome), Aluminum alloy (Duralumin and Alnico).

D) Green Chemistry: Definition, Twelve principles of Green Chemistry.

Term work:

List of Experiments:

Minimum 8 experiments should be performed from the following list out of which two experimentsshould be demonstrative on instrumental methods.

1. Determination of acidity of water.
2. Determination of alkalinity of water.
3. Determination of chloride content of water by Mohr's method.
4. Determination of total hardness of water by EDTA method.
5. Determination of moisture, volatile and ash content in a given coal sample by proximateanalysis.
6. Preparation of urea-formaldehyde resin.
7. Preparation of phenol-formaldehyde resin.
8. Determination of percentage of copper in brass.
9. Estimation of zinc in brass solution.
10. Determination of rate of corrosion of aluminium in acidic and basic medium.

11. Demonstration of pH meter.
12. Demonstration of photo-colorimeter / spectrophotometer.
13. Demonstration of paper chromatography.

Reference books:
1. Engineering Chemistry by Jain and Jain, Dhanpat Rai Publishing Company Ltd., New Delhi.
2. A Textbook of Engineering Chemistry by S. S. Dara and S. S. Umare, S. Chand & Company Ltd.,New Delhi.
3. A Textbook of Engineering Chemistry by C. P. Murthy, C. V. Agarwal and A. Naidu, BS Publications, Hyderabad.
4 Chatwal and Anand, Instrumental Methods of Chemical Analysis, Himalaya Publishing House, NewDelhi.
5 Engineering Chemistry by Dr. A. K. Pahari and Dr. B. S. Chauhan, Laxmi Publications (P) Ltd, NewDelhi.
6. A text Book of Engineering Chemistry by ShashiChawla, DhanpatRai& Co. (Pvt.) Ltd, Delhi.
7. Engineering Chemistry by Wiley India.
8. Engineering Chemistry by RenuBapna and Renu Gupta, MacMillan Publishers (India) Ltd, Delhi.

Sr. No	Sem.	Code No.	Subject	Credits
2	II	BSC-M-II-202	Engineering Mathematics-II	4

COs:
At the end of course the student should be able to:
1 Solve the differential Equations using various methods
2 apply the knowledge of solutions of differential equations on engineering problems
3 Use Numerical methods to solve differentia equations
4 Find the roots of Algebraic and transcendental equations
5 To understand the concept evaluation of the definite integral using Special Functions
6 Use the knowledge of evaluation of double integral and to apply it to find Area and mass of plane lamina

Syllabus:

Course	Teaching Scheme					Evaluation Scheme			
						Theory(Marks)		Practical(Marks)	
	L	T	P	Credit	Scheme	Max.	Min. for Passing	Max.	Min. for passing
Engineering Mathematics II	03	-	01	04	ISE	-	-	25	40%
					MSE	30	40%	-	-
					ESE	70	40%	-	-

ISE: In Semester Evaluation   MSE: Mid Semester Evaluation   ESE: End Semester Evaluation

SECTION-I

Unit 1: Ordinary Differential Equations of First Order and First Degree (7)
(Weightage 10 Marks in Shivaji Uni Exam of 70 marks)
1. Linear differential equations
2. Reducible to Linear differential equations
3. Exact differential equations
4. Reducible to Exact differential equations

Unit 2: Applications of Ordinary Differential Equations of First Order and First Degree **(6)**
(Weightage 10 Marks in Shivaji Uni Exam of 70 marks)
   1. Applications to Orthogonal trajectories (Cartesian and Polar equations)
2. Applications to Simple Electrical Circuits
3. Newton's law of cooling

Unit 3: Numerical Solution of Ordinary Differential Equations of First Orderand FirstDegree(Weightage 15 Marks in Shivaji Uni Exam of 70 marks)**(8)**
1. Taylor's series method
2. Euler's method
3. Modified Euler's method
4. Runge-Kutta fourth order formula

SECTION-II

Unit 4:Numerical Solutions Of Algebraic and Transcendental Equations **(6)**
   (Weightage 10 Marks in Shivaji Uni Exam of 70 marks)
1. Bisection Method
2. Secant Method
3. Newton Raphson Method

Unit 5: Special Functions **(7)**
   (Weightage 10 Marks in Shivaji Uni Exam of 70 marks)
1 Gammafunction and its properties
2. Beta function and its properties
3. Error function and its properties

Unit 6: Multiple Integration and its applications: **(8)**
   (Weightage 15 Marks in Shivaji Uni Exam of 70 marks)
1. Double Integrals and evaluation
2. Change of order of integration
3. Change into Polar Coordinates
4. Area enclosed by plane curves
5. Mass of a plane lamina

General Instructions:
1. Batch wise tutorials are to be conducted. The number of students per batch should be as per theUniversity pattern for practical batches.
2. Minimum number of assignments should be 8 covering all topics.

Recommended Books:

1. A text book of Applied Mathematics, Vol.-I by P. N. Wartikar& J. N. Wartikar,Pune Vidyarthi Griha Prakashan, Pune.
2. A text book of Applied Mathematics, Vol.-II by P. N. Wartikar& J. N. Wartikar,PuneVidyarthi Griha Prakashan, Pune.
3. Dr. B. S. Grewal - Higher Engineering Mathematics by Dr. B. S. Grewal, Khanna Publishers,Delhi.

Reference Books:
1. Higher Engineering Mathematics by B.V.Ramana, Tata McGraw-Hill Publications, NewDelhi
2. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley India Pvt. Ltd.
3. Advanced Engineering Mathematics by H. K. Dass.
4. Mathematical methods of Science and Engineering by Kanti B. Datta, Cengage Learning.
5. A textbook of Engineering Mathematics Volume I by Peter V. O'Neil and Santosh K. Sengar,Cengage Learning.
6. A textbook of Engineering Mathematics by N. P. Bali, Iyengar, Laxmi Publications (P) Ltd .,NewDelhi.

Sr. No	Sem.	Code No.	Subject	Credits
3	I	ESC-C-203	Fundamentals of Electronics and Computer Programming	4

Co`s:

At the end of this course, student will be able to:

1 Choose appropriate components to design basic circuit in electronics engineering.

2 Construct the digital circuit using Boolean laws.

3 Identify transducers as per application and describe functioning of several electronic appliances.

4 Explain complete computer hardware and its peripheral.

5 Outline of Operating System Features, Types and Explain the System Software's and data representation in computer.

6 Recognize and explain the Computer Networks and programming techniques.

Syllabus:

Course	L	T	P	Credit	Scheme	Theory(Marks) Max.	Theory(Marks) Min. for Passing	Practical(Marks) Max.	Practical(Marks) Min. for passing
Fundamentals of Electronics and Computer Programming	03	-	02	04	ISE	-	-	25	40%
					MSE	30	40%	-	-
					ESE	70	40%	-	-

ISE: In Semester Evaluation   MSE: Mid Semester Evaluation   ESE: End Semester Evaluation

SECTION I

Unit 1: Semiconductor Devices and Applications (7)

(Weightage 12 Marks in Shivaji Uni Exam of 70 marks)

Semiconductor Diode, Half wave, Full wave, Bridge rectifier, Voltage Regulator Using Zener Diode,BJT: characteristics, CE configuration, CE as an amplifier. Load Line, Operating Point, Leakage Currents, Saturation and Cut off Mode of Operations.

Unit 2: Digital Electronics (7)

(Weightage 11 Marks in Shivaji Uni Exam of 70 marks)

Logic Gates, Boolean algebra, Comparison of Specifications of Logic Families,

Combinational Logic,Half Adder, Full Adder, Multiplexer, De-Multiplexer.

Unit 3: Applications (7)

(Weightage 12 Marks in Shivaji Uni Exam of 70 marks)

A Transducers: for Displacement (LVDT), Temperature (RTD), Pressure (Strain Gauge), Speed (ShaftEncoder), Range, Specifications and Limitations.

B Appliances: Operation of Appliances: Digital Thermometer, Weighing Machine, Washing Machine,Microwave Oven and Tachometer.

SECTION II

Unit 4: Computer Basics and Hardware (5)

(Weightage 12 Marks in Shivaji Uni Exam of 70 marks)

A Generations & Classification of Computers.

B Computer System Architecture– CPU, Input Unit, Output Unit, Storage Unit.

C Applications of Computers.

Unit 5: Data Representation and Computer Software (8)

(Weightage 11 Marks in Shivaji Uni Exam of 70 marks)

A) Data Representation In Computer: Types Of Number System – Binary, Octal, Decimal, Hexadecimal & Their Conversions, Coding Schemes – ASCII, Unicode.

B) Computer Software:

a) Operating System: Types Of Operating System, Functions, Unix/Linux Commands: Listing,Changing, Copying, And Moving Files & Directories (ls, cd, cat, mkdir, rmdir)

b) System Software: Assembler, Interpreter, Compiler.

c)Application Software's: Word Processor, Spreadsheets, Presentation andtheir Applications.

Unit 6: Computer Programming and Networks **(8)**

(Weightage 12 Marks in Shivaji Uni Exam of 70 marks)

A) Computer Programming: Program Development Cycle, Algorithm, Flowchart,Programming

Control Structures – Sequence, Selection, and Repetition.

B) Introduction to Computer Networks: Definition Of Computer Network, Need,

Standards: OSI,TCP/IP, Types of Networks: LAN, WAN, MAN, Network Topologies.

Term work: FUNDAMENTAL OF ELECTRONICS

List of Experiments: Minimum 4 experiments should be performed from the following list.

    a. Testing of Electronic components- resistors, capacitors, inductor, diode,

       transistor, LED andSwitches using multi-meter &C.R.O.

    b. V-I Characteristics of PN junction diode and Zener diode.

    c. Study of Half and Full wave rectifiers and their comparison.

    d. Study of Frequency response of CE amplifier.

    e. Study of truth tables of logic Gates: OR, AND, NOT, NAND, NOR, EXOR.

    f. Study of MUX/DEMUX.

    g. Measurement of Displacement using LVDT/strain Gauge.

    h. Measurement of Temperature using any transducer.

Self-Learning Activities: Different types of Communication systems & Communication Media.

Term work: FUNDAMENTAL OF COMPUTER

List of Experiments: Minimum 4 experiments should be performed from the following list.

  1 Study of computer system – Internal Components & peripherals.

  2 Use of Unix/Linux commands & create a file using any editor in Linux.

  3 Create a document using any word processor (In Linux (open office) /Windows (Microsoft office).

  4 Use any spreadsheet application to manipulate numbers, formulae and graphs (In Linux/Windows).

  5 Use any power point presentation application and create a professional power point

    presentationusing text, image, animation etc. (In Linux/Windows).

  6 An assignment based on use of Internet and Web for searching and downloading Technical

    information.

  7 Study of Tablet and Android Operating System Features and applications.

Text Books:
1 A Text Book of Applied Electronics by R S Sedha, S. Chand

2 Basic Electronics Engineering by Vijay Baru, RajendraKaduskar, S T Gaikwad (Wiley/ DREAMTECH)

3 Digital Principles & Applications by Albert Malvino, Donald Leach, TMGH Publication.

4 Principle of Electronics by V.K. Mehata, S. Chand

5 Electronic Instrumentation by H. S. Kalasi, Tata McGraw Hills Publication

Reference Books:

1 Electronics Devices and Circuit Theory by Robert L. Boylestad and Louis Nashelsky
   (PearsonEducation Publication)

2 Fundamental of Digital Circuits by A. Anand Kumar (PHI- Publication)

3 Fundamental of Electronics Engineering by R.Prasad(CENGAGE- Learning)

4 Introduction to Information Technology, ITL Education Solutions LTD. Pearson Education

5 Fundamentals of Computers by V. Rajaram, PHI Publications.

6 UNIX concepts and applications by Sunitabha Das, TMGH.

7 Computer Fundamentals Archetucture and Organization by B.Ram New Age International Publishers.

Sr. No	Sem.	Code No.	Subject	Credits
4	II	ESC-C-204	Applied Mechanics	4

COs:

At the end of successful completion of course, the student will be able to-
1. Find the resultant and locate it from any point for any given structures
2. Compute the support reactions for any given beam
3. Explain geometric properties of plain lamina and solve it for Moment of Inertia.
4. Solve the problems on kinetics of linear and circular motions & explain the effect of impact loads on various bodies.

Syllabus:

Course	L	T	P	Credit	Scheme	Theory(Marks)		Practical(Marks)	
						Max.	Min. for Passing	Max.	Min. for passing
Applied Mechanics	03	-	02	04	ISE	-	-	25	40%
					MSE	30	40%	-	-
					ESE	70	40%	-	-

ISE: In Semester Evaluation   MSE: Mid Semester Evaluation   ESE: End Semester Evaluation

SECTION I

Unit 1: Fundamentals of Statics (7)
Basic Concepts and Fundamental Laws, Force, Moment and Couple, System of Forces, Resultant, Resolution and Composition of Forces, Varignon's Theorem, Law of Moments.

Unit 2: Equilibrium (7)
Lami s' Theorem, Free Body Diagram, Equilibrium of Forces, Equilibrium conditions, Surfacefriction for bodies on horizontal and inclined planes.
Beams: Types of Loads, Types of supports, Analysisof Simple beams, Virtual work method forsupport reactions.

Unit 3: Centroid and Moment of Inertia (7)
Centroid and Center of Gravity, Moment of Inertia of Standard shapes from first principle, Parallel and perpendicular axis theorem, Moment of Inertia of plain and composite figures, Radius of Gyration.

SECTION II

Unit 4: Kinetics of Linear (8)
Introduction to Kinematics of Linear motion (no numerical on kinematics), Kinetics of linear motion, Newton's Laws, D'Alembert's Principle, Work- Energy Principle, Impulse Momentum Principal

Unit 5: Kinetics of Circular Motion (8)
Introduction to Kinematics of Circular motion (no numerical on kinematics), Rotation with constant and variable angular acceleration, centripetal and centrifugal force, condition of skidding and overturning.

Unit 6: Impact and Collision (5)
Impact, Types of Impact, Law of conservation of Momentum, Coefficient of Restitution,Numerical on Direct central Impact.

Term work:
   Student can choose either Model 1 or Model 2 for performing practical

Model 1	Model 2
A) Experiments:	
1. Law of polygon of forces	**1.** Law of polygon of forces
2. Jib crane	**2.** Jib crane
3. Bell crank lever	**3.** Bell crank lever
4. Support Reactions of Beam	**4.** Support Reactions of Beam
5.Fleture's Trolley	**5.** Centrifugal force
B) Graphics Statics: (To be solved on A3 sheet)	
1. To find Resultant - 3 problems	1. To find Resultant - 3 problems
2.To find support reactions - 3 problems	**2.**To find support reactions - 3 problems
C) Home Assignments	

At least one assignment on each unitwith minimum 5 numericals	At least one assignment on each unitwith minimum 5 numericals

Reference Books:
1. Engineering Mechanics by S. S. Bhavikattis, New Age International Pvt. Ltd.
2. Engineering Mechanics by R. K. Bansal and Sanjay Bansal.
3. Vector Mechanics for Engineers Vol.I and II by F. P. Beer and E. R. Johnston, Tata Mc-GrawHill Publication.
4. Engineering Mechanics by Manoj K Harbola, Cengage Learning
5. Engineering Mechanics by K. I. Kumar, Tata Mc-Graw Hill Publication
6. Engineering Mechanics by S. B. Junnerkar.
7. Engineering Mechanics by Irving H. Shames, Prentice Hall of India, New Delhi. 8. Applied Mechanics by S. N. Saluja, Satya Prakashan, New Delhi.
8. Engineering Mechanics by Statics and Dynamics by Ferdinand Singer, Harper and RowPublications
9. Engineering Mechanics by R. S. Khurmi, S. Chand Publications
10. Fundamentals of Engineering Mechanics by S. Rajasekaran, G. Sankarasubramanian, Vikas Publishing House
11. "Applied Mechanics- Dynamics &Statics " by I.B.Prasad, Khanna Publisher, Delhi

Sr. No	Sem.	Code No.	Subject	Credits
5	II	ESC-C-205	Basic Mechanical Engineering	4

CO`s:
At the end of successul completion of course, the students should able to-
1. Explain basics of thermodynamics , thermodynamics laws and apply first law of thermodynamics for steady flow process.
2. Classify and demonstrate the heat engines, like I.C.Engines , Refrigeration systems,Air conditioning and different air standered cycles.
3. Explain different energy sources and construction,working of different types of power plants and solar collectors.
4. Demonstrate and select mechanical power transmission and energy conversion devices as well as manufacturing processes.

Syllabus:

Course	Teaching Scheme					Evaluation Scheme			
						Theory(Marks)		Practical(Marks)	
	L	T	P	Credit	Scheme	Max.	Min. for Passing	Max.	Min. for passing
Basic Mechanical Engineering	03	-	02	04	ISE	-	-	25	40%
					MSE	30	40%	-	-
					ESE	70	40%	-	-

ISE: In Semester Evaluation   MSE: Mid Semester Evaluation   ESE: End Semester Evaluation

Unit1:Thermodynamics(7) Thermodynamic State, Process, Cycle, Thermodynamic System, Heat, work, Internal Energy,First Law of Thermodynamics, Application of First Law to steady Flow processes,Limitations of First Law(Numerical Treatment) Statements of Second Law of Thermodynamics.(12 marks)

Unit 2: Introduction to I C Engine (7)
Carnot Engine, Construction and Working of C.I. and S.I., Two stroke, Four Stroke Cycles,Air standard cycles- Carnot Cycle, Joule Cycle, Otto Cycle, Air Standard efficiency (DescriptiveTreatment only) (12 marks)

Unit 3: Introduction to Refrigeration and Air Conditioning (6)
Carnot refrigerator, Refrigerant types and properties, Vapour compression and vapourabsorption system, solar refrigeration, Window Air Conditioning, Psychometric properties ofmoistair, Applications of refrigeration and air conditioning (Descriptive Treatment only).(11 marks)

Unit4:EnergySources and power plants (7)
Renewable and nonrenewable, Solar-flat plate collector, concentric collector–Parabolic andcylindrical, Photovoltaic cell, Wind, Hydropower plant, Steam Power plant,Bio-gas, Bio-Diesel (Descriptive Treatment only). (12 marks)

Unit 5: Mechanical Power Transmission and Energy conversion devices(7)
Type of Belt and belt drives, chain drive, Types of gears and gear Trains, (Numerical Treatment on beltdrive), Construction, workingand applications of centrifugal Pump, Reciprocating compressor and Peloton wheel Turbine.(12 marks)

Unit 6: Manufacturing Processes   (6)
Introduction to manufacturing processes - Casting Process, Steps involved in castingprocesses, and their applications, Metal removing processes (Lathe, milling & drilling operations) Metal JoiningProcesses – Arc welding, soldering and brazing and their applications.(11 marks)

Term Work:
List of experiments: Minimum 8 experiments should be performed from the following list--
1   Demonstration of I.C. engine
2   Demonstration of Two stroke and four stroke engine
3   Demonstration of vapor compression refrigeration system and window airconditioner.
4   Demonstration of Solar water heating system.
5   Demonstration of Steam or Hydroelectric Power Plant
6   Demonstration of Diesel power plant
7   Demonstration of types of Gears and gear trains.
8   Demonstration of pumps and compressor.
9   Demonstration of hydraulic turbine
10 Demonstration of metal joining processes.
11 Demonstration of metal removal processes
12 Industrial visit based on syllabus.

Reference Books:

1 Solar Energy by Dr.S.P. Sukathame,Tata Mc-Graw Hill Publication
2 Non-Conventional Sources of Energy by G.D. Rai, Khanna Publication
3 Engineering Thermodynamics by R.Joel, The English Language Book Society.
4 Engineering Thermodynamics by Achultan, Prentice Hall of India.
5 Thermal Engineering by R.K. Rajput, Laxmi Publication, Delhi.
6 Elements of Heat Engine Vol.I,II,III by Patel and Karamchandani, Acharya Book Depot.
7 Power Plant Engineering by Arora and Domkunwar, Dhanpat Rai and Sons.
8 Manufacturing Technology Volume I and II by P. N. Rao, Tata Mc-Graw Hill Publication
9 Elements of Workshop Technology, Vol.I and II by HajaraChoudhari, Media Promoters
10 Basic Mechanical Engineering by Basant Agrawal & C. M. Agrwal, Wiley India Pvt. Ltd.11.Energy Technology by S. Rao and Dr.B.B. Parulekar, Khanna Publication.

Sr. No	Sem.	Code No.	Subject	Credits
6	II	HM-II-206	Professional Communication-II	2

COs:

At the end of course the student should be able to:
1 Define various types of technical reports.
2 Illustrate positive attitude, time and stress management.
3 Demonstrate the students present yourself professionally.
4 Understand corporate manners, planning and managing career.
5 Demonstrate the group discussion, debate and interview.

Syllabus:

Course	Teaching Scheme					Evaluation Scheme			
						Theory(Marks)		Practical(Marks)	
	L	T	P	Credit	Scheme	Max.	Min. for Passing	Max.	Min. for passing
Professional Communication-II	01	-	02	02	ISE	-	-	25	40%
					MSE	-	-	-	-
					ESE	-	-	-	-

ISE: In Semester Evaluation   MSE: Mid Semester Evaluation ESE: End Semester Evaluation

Unit 1: Developing Writing Skills(3)
1. Importance of technical writing
2. Report Writing:
a) Techniques of Report Writing
b) Methods of data collection
c) Types of Report Writing- Survey, Inspection and Investigation

Unit 2: Behavioral Skills(5)
1. Understanding Self (SWOT analysis)

2. Attitude Building/ Developing Positive attitude
3. Decision Making Skills
4. Leadership Skills
5. Stress Management
6. Time Management
7. Team Work

Unit 3: Presentation Skills(2)
1. Importance & techniques
2. Presenting yourself professionally
   Unit 4: Career skills (4)
1. Corporate Manners and Etiquettes
2. Planning and Managing Career
3. Job Application and Resume
4. Interview: Techniques& skills
5. Group Discussion
6. Debate

Term Work: Any 8 out of the following should be conducted
1. Group Discussion (lab session/class room activity)
2. Mock Interview
3. Report writing (lab session/class room activity)
4. Paragraph writing on current technical writing
5. Presentation on current affairs
6. Developing Professional Telephonic skills
7. Exercise of Application writing and Resume writing
8. Practice of Case Study
9. Team building activities
10. Report writing (3 types)
11. Introduction and use of modern communication techniques
12. Computer aided presentation of a project report (PPT)

Instructions:
1. Minimum 7 assignments should be covered.
2. Use of language lab is mandatory for both the semesters.

Reference Books:
1. Handbook for Technical Writingby David A. McMurrey, Joanne Buckley, Cengage.
2. A Course in Englishby J.D. O'Connor.
3. Better English Pronunciation by J.D. O'Connor.
4. Communication Skills Handbook: How to succeed in written and oral communication byJaneSummers, Brette Smith, Wiley India Pvt.Ltd.
5. Personal Development for Life and Work by Masters, Wallace, Cengage.
6. Soft Skills for Managers by Dr. T. KalyanaChakravarthi, Dr. T. LathaChakravarthi,Biztantra.
7. Soft Skills for every one by Jeff Butterfield, Cengage.
8. Behavioural Science by Dr.Abha Singh, Wiley India Pvt.Ltd.
9. An Introduction to Professional English and Soft Skills by Bikram K. Das, KalyaniSamantray,Cambridge University Press New Delhi.
10. Speaking Accurately, K.C. Nambiar, Cambridge University Press New Delhi.
11. Speaking Effectivelyby Jeremy Comfort, Pamela Rogerson, Cambridge University PressNew Delhi.
12. Cambridge English for Job Hunting by ColmDownes, Cambridge University Press NewDelhi.

13. Body Language by Allen Pease.
14. The Ace of Soft Skills by Gopalswami Ramesh, Mahadevan Ramesh, PearsonPublication, Delhi.
15. Decision Making Skills by Khanka S.S.
16. Business Ethics and Communication by C.S. TejpalSheth.
17. Write Right by Syed AbdurRaheem.

Sr. No	Sem.	Code No.	Subject	Credits
7	II	ESC-W-II-207	Workshop Practice-II	2

Syllabus:

Course	Teaching Scheme					Evaluation Scheme			
						Theory(Marks)		Practical(Marks)	
	L	T	P	Credit	Scheme	Max.	Min. for Passing	Max.	Min. for passing
Workshop Practice-II	01	-	02	02	ISE	-	-	25	40%
					MSE	-	-	-	-
					ESE	-	-	-	-

ISE: In Semester Evaluation   MSE: Mid Semester Evaluation   ESE: End Semester Evaluation

Unit 1: Welding (4)
Types of welding – gas welding, arc welding, resistance welding, Welding equipment's,welding ofvarious metals, electrode classification and coding, welding joints.

Unit 2: Carpentry (4)
Introduction, Classifications of wood, common varieties of Indian timber, carpentry toolslike-Marking tools, cutting tools, planes, striking tools, holding tools. Carpentry operations-marking,sawing,chiseling,grooving etc. carpentry joints.

Unit 3: Sheet metal work (4)
Specifications of metal sheets, working tools, sheet metal operations like-cutting, bending,folding,punching, reverting and joining by brazing and soldering.

Unit 4: Air pollution: (2)
Air pollution due to automobiles, causes, PUC testing.
Term work:
The term work consists of assignment on Welding, Carpentry, Sheet metal work, Airpollution.Every student should perform---
1. Welding: One job on Arc welding- Lap / Butt Joint etc. (For individual student)OR
Table, Shoe stand, Bag stand etc. (For 4-6 students)
2. Carpentry :One composite job involving dovetail joint, T joint, cross halving joint, pen standetc.(Forindividual student)

OR

Table, Teapot, Stool etc. (For 4-6 students)

3. Sheet metal Work:

One job on commercial items such as Dust bin, funnel, tray etc.

Reference Books:

1. A Course in Workshop Technology, Vol – I by B. S. Raghuvanshi, Dhanapat Rai and Sons.
2. Elements of Workshop Technology, Vol – I by HajaraChaudhari, Media Promoters.
3. Workshop Technology, Vol – I by Gupta and Kaushik, New Heights.
4. Workshop Technology, Vol – I by Chapman, The English Language Book Society.
5. Workshop technology, Vol.-I by H.S. Bawa, TMH Publications, New Delhi.
6. I.C. Engines by Mathur& Sharma, Dhanpat Rai Publications, New Delhi.

Physics Group

	Physics Group		
Sr. No	**Code No.**	**Subject**	**Credits**
1.	BSC-P-201	Engineering Physics	4
2.	BSC-M-II-202	Engineering Mathematics-II	4
3.	ESC-P-203	Basic Electrical Engineering	4
4.	ESC-P-204	Basic Civil Engineering	4
5.	ESC-P-205	Engineering Graphics	4
6.	HM-II -206	Professional Communication-II	2
7.	ESC-W-II-207	Workshop Practice-II	2
		Total	24

Sr. No	**Sem.**	**Code No.**	**Subject**	**Credits**
1	II	BSC-P-201	Engineering Physics	4

COs:

At the end of the course the students should be able to:

1. To acquire and apply basic knowledge of Physics in technical fields
2. Bring adaptability to new developments in Engineering Physics and to acquire the skills required to become a perfect engineer.
3. To integrate pure Physics principles and fundamentals with Engineering Applications.

Syllabus:

Course	**Teaching Scheme**					**Evaluation Scheme**			
	L	**T**	**P**	**Credit**	**Scheme**	**Theory(Marks)**		**Practical(Marks)**	
						Max.	**Min. for Passing**	**Max.**	**Min. for passing**
Engineering Physics	03	-	01	04	ISE	-	-	25	40%
					MSE	30	40%	-	-
					ESE	70	40%	-	-

ISE: In Semester Evaluation   MSE: Mid Semester Evaluation   ESE: End Semester Evaluation

SECTION – I

Unit 1.Diffraction and Polarization of Light :(12 Marks)(7)

Diffraction : Diffraction- Concept and types (Fresnel and Fraunhofer diffraction), Diffraction grating – construction and theory, resolving power of plane transmission grating.

Polarization: Introduction, double refraction, Huygens' theory (positive and negative crystals), Optical Activity, Specific Rotation, Laurent's half shade polarimeter.

Unit 2. Laser and Fibre Optics:(12 Marks)(7)LASER :

Absorption, spontaneous emission, stimulated emission, pumping, population inversion, Ruby laser, characteristics of laser, Holography (construction and reconstruction)

Fibre Optics:

Total Internal Refection, structure of optical fibre, acceptance angle, acceptance cone, numerical apertureand fractional refractive index change (noderivation), fibre optic communication system, advantages of optical fibres.

Unit 3. Sound: (11 Marks)(7)

Conditions for good acoustics, Reverberation, Reverberation time, Sabine's formula for reverberation time (no derivation), Absorption coefficient, Factors affecting architectural acoustics and their remedy.

SECTION – II

Unit 4.Crystal Physics: (12 Marks)(7)

Space Lattice, Basis and Crystal structure, Unit cell, Seven crystal system, number of atoms per unit cell, coordination number, atomic radius, packing fraction, relation between density and lattice constant, Miller indices - procedure, features and sketches for different planes, symmetry elements of cubiccrystal, Bragg's law for X-ray diffraction.

Unit 5. Physics of Nano-materials: (12 Marks)(7)

Concept- Nanomaterial, Nanoscience and Nanotechnology, production techniques(Top down and bottom up), Ball milling and Colloidal technique for synthesis of nano particles, Types of Nanomaterial, Tools- Scanning Tunneling Microscope and Atomic Force Microscope, properties and applications of nano-materials.

Unit 6.QuantumMechanics   (11 Marks)(7)

Wave-particle duality of light, dual nature of matter (De-Broglie's concept of matter waves) Wavelengthof matter wave in terms of K.E. and P. D., Properties of matter waves, Heisenberg's uncertainty principle for position and momentum, Compton Effect (Statement, explanation and experimental verification).

List of Experiments;

Minimum 8 experiments should be performed from the following list.

1 Bi-prism experiment
2 Diffraction at Cylindrical obstacle.
3 Calculation of divergence of LASER beam.
4 Determination of wavelength of LASER using diffraction grating.
5   Wavelength of different spectral lines of mercury using grating.
6 Polarimeter.
7 Verification of inverse square law of intensity of light.
8 Resolving power of Telescope
9 Measurement of band gap energy.

10 Study of crystal structure.

11 Study of symmetry elements of cubic crystal.

12 Determination of 'd' (interplaner distance) using XRD pattern.

13 Study of Planes with the help of models related Miller Indices.

14 Determination of e/m of an electron

15 R. P. of grating

References :

1 R. K. Gaur & Gupta S. L, Engineering Physics –Dhanapat Rai Publication.

2 M. N. Avadhanulu & P. G. Kshirsagar - A Text Book of Engineering Physics -S. Chand Publication.

3 B. L. Theraja -Modern Physics - S. Chand & Company Ltd., Delhi.

4 Subramanyam & BrijLal, A Text Book of Optics –S. Chand & Company (P.) Ltd.

5 B. K. Pandey and S. Chaturvedi- Engineering Physics, Cengage Learning-2012

6 S. O. Pillai, Solid State Physics : Structure & Electron Related Properties, Eastern Ltd,, New AgeInternational Ltd.

7 Charles Kittle, Introduction to Solid State Physics - Wiley India Pvt. Ltd.(8thEdtion).

8 V. Rajendran – Engineering Physics- Mc. Graw Hills

9 Alan Giambattista and others- Fundamentals of physics, Tata Mc. Graw Hills

10 Vijay Kumari- Engineering Physics, Vikas Publications

11 Resnick Halliday, Physics Volume-I, Krane -John Wiley & Sons Pub.

12 Resnick Halliday, Physics Volume-II, Krane -John Wiley & Sons Pub.

13 Hitendra K. Malik, A. K. Singh – Engineering Physics - Tata Mc. Graw Hills Education Private Ltd.

14 A. Beiser – Concepts of Modern Physics - Tata Mc. Graw Hills

L. J. Schiff – Quantum Mechanics - Tata Mc. Graw Hills

Sr. No	Sem.	Code No.	Subject	Credits
2	II	BSC-M-II-202	Engineering Mathematics-II	4

COs:

At the end of course the student should be able to:

1 Solve the differential Equations using various methods

2 apply the knowledge of solutions of differential equations on engineering problems

3 Use Numerical methods to solve differentia equations

4 Find the roots of Algebraic and transcendental equations

5 to understand the concept evaluation of the definite integral using Special Functions

6 Use the knowledge of evaluation of double integral and to apply it to find Area and mass of plane lamina

Syllabus:

Course	Teaching Scheme					Evaluation Scheme			
						Theory(Marks)		Practical(Marks)	
	L	T	P	Credit	Scheme	Max.	Min. for Passing	Max.	Min. for passing
Engineering Mathematics II	03	-	01	04	ISE	-	-	25	40%
					MSE	30	40%	-	-
					ESE	70	40%	-	-

ISE: In Semester Evaluation   MSE: Mid Semester Evaluation   ESE: End Semester Evaluation

IISECTION-I

Unit 1: Ordinary Differential Equations of First Order and First Degree (7)
(Weightage 10 Marks in Shivaji Uni Exam of 70 marks)
7 Linear differential equations
8 Reducible to Linear differential equations
9 Exact differential equations
10Reducible to Exact differential equations

Unit 2: Applications of Ordinary Differential Equations of First Order and First Degree (6)
(Weightage 10 Marks in Shivaji Uni Exam of 70 marks)
1.Applications to Orthogonal trajectories (Cartesian and Polar
equations)
2 Applications to Simple Electrical Circuits
3 Newton's law of cooling

Unit 3: Numerical Solution of Ordinary Differential Equations of First Order and FirstDegree
(Weightage 15 Marks in Shivaji Uni Exam of 70 marks)**(8)**
1 Taylor's series method
2 Euler's method
3 Modified Euler's method
4 Runge-Kutta fourth order formula

SECTION-II

Unit 4:Numerical Solutions Of Algebraic and Transcendental Equations   **(6)**
(Weightage 10Marks in Shivaji Uni Exam of 70 marks)
1 Bisection Method
2 Secant Method
3   Newton Raphson Method
Unit 5: Special Functions   **(7)**
(Weightage 10 Marks in Shivaji Uni Exam of 70 marks)   1.
Gammafunction and its properties
1 Beta function and its properties
2Error function and its properties

Unit 6: Multiple Integration and its applications: **(8)**
(Weightage 15 Marks in Shivaji Uni Exam of 70 marks)
Double Integrals and evaluation

Change of order of integration
Change into Polar Coordinates
Area enclosed by plane curves
Mass of a plane lamina

General Instructions:

1 Batch wise tutorials are to be conducted. The number of students per batch should be as per theUniversity pattern for practical batches.

2 Minimum number of assignments should be 8 covering all topics.
   Recommended Books:
3 A text book of Applied Mathematics, Vol.-I by P. N. Wartikar& J. N. Wartikar,Pune Vidyarthi Griha Prakashan, Pune.
4 A text book of Applied Mathematics, Vol.-II by P. N. Wartikar& J. N. Wartikar,PuneVidyarthi Griha Prakashan, Pune.
5 Dr. B. S. Grewal - Higher Engineering Mathematics by Dr. B. S. Grewal, Khanna Publishers,Delhi.
   Reference Books:
   1 Higher Engineering Mathematics by B.V.Ramana, Tata McGraw-Hill Publications, NewDelhi
   2 Advanced Engineering Mathematics by Erwin Kreyszig, Wiley India Pvt. Ltd.
   3 Advanced Engineering Mathematics by H. K. Dass.
   4 Mathematical methods of Science and Engineering by Kanti B. Datta, Cengage Learning.
   5 A textbook of Engineering Mathematics Volume I by Peter V. O'Neil and Santosh K. Sengar,Cengage Learning.
   6 A textbook of Engineering Mathematics by N. P. Bali, Iyengar, Laxmi Publications (P) Ltd .,NewDelhi

Sr. No	Sem.	CodeNo.	Subject	Credits
3	II	ESC-P-203	Basic Electrical Engineering	4

COs:

At the end of the course the students should be able to :
  1) Define the basic parameters of AC,DC and Magnetic circuit.
  2) Explain the working principle of single phase transformer and different types of lamps
  3) Solve the numerical based on AC, DC circuits and efficiency & losses of transformer.
  4) Classify the different types of earthing and transformer.

Syllabus:

Course	Teaching Scheme					Evaluation Scheme			
						Theory(Marks)		Practical(Marks)	
	L	T	P	Credit	Scheme	Max.	Min. for Passing	Max.	Min. for Passing
Basic Electrical Engineering	03	-	02	04	ISE	-	-	25	40%
					MSE	30	40%	-	-
					ESE	70	40%	-	-

ISE: In Semester Evaluation   MSE: Mid Semester Evaluation   ESE: End Semester Evaluation

SECTION I

Unit1: Analysis of D.C. circuits: **(8)**

(Weightage 12 Marks in Shivaji Uni Exam of 70 marks)

Concept of E.M.F, Potential Difference, Current, Resistance, Ohm's Law

Kirchhoff'slaws, mesh and node analysis

(Numerical on Mesh and Nodal Analysis of Two loops)

Unit 2:Magnetic circuits:(8)

(Weightage 11 Marks in Shivaji Uni Exam of 70 marks)

Concept of mmf, reluctance, magnetic flux, Magnetic Flux density, Magneticfield strength, BH curve, magnetic leakage, fringing, Comparison of Electric and Magnetic circuit, series magnetic circuits (Theoretical Concepts only).

Unit 3: Single phase AC Circuits: **(8)**

(Weightage 12 Marks in Shivaji Uni Examof 70 marks)

Fundamentals of Alternating quantities, Faraday's Law, Types of Induced E.M.F ,Generation of sinusoidal voltage, concept of R.M.S. & Average value, form factor, Peak Factor, Pure Resistive, Inductive, Capacitive , R-L, R-C, R-L-C seriescircuits, powers, Significance of power factor.

(Numerical Treatment on Series R-L, R-C, R-L-C circuits)

SECTION II

Unit 4: Three phase A.C. Circuits **(7)**

(Weightage 12 Marks in Shivaji Uni Examof 70 marks)

Advantages of 3 phase system, Generation of 3 phase AC supply, balanced 3 phase load, relation between line and phase quantities for star connected circuit anddelta connected circuit.

Unit 5:Earthing and lamps: **(7)**

(Weightage 11 Marks in Shivaji Uni Exam of 70 marks)

Necessity of Earthing, Earthing methods, Fuse (rewireble and HRC). MCB, Incandescent Lamp, Fluorescent tube, CFL, LED lamp, Mercury vapour lamp, singleline diagram of electrical systems.

Unit 6: Single phase Transformer: **(8)**

(Weightage 12 Marks in Shivaji Uni Examof 70 marks)

Construction, operating principle, Types, emf equation, Ratios of voltage andcurrent,
operation on no load and with load, power losses, efficiency, voltage regulation,
applications.

(Numerical Treatment on E.M.F Equations &Transformer losses and Efficiency)

List of Experiments
Minimum 8 experiments should be performed from the following list.

1 Laboratory Sessions covering,General Introduction to Electrical Engineeringlaboratory,
   Experimental Set ups, Instruments etc.. Electrical Symbols.
2 Electric Shocks and precautions against shocks(Do's and Don'ts) .
3 Study of Ohm's Law.
4 Verification of Kirchhoff's Voltage Law and Kirchhoff's Current Law.
5 B-H curve of magnetic material.
6 Study of Faraday's law.
7 Determination of Reactance's for Series R-L- C Circuit.
8 Measurement of active and reactive power in balanced 3-phase circuit usingTwo-watt
   meter method.
9 Study of Basic methods of Earthing. Use of Fuse and Miniature Circuit breaker.
10 Study of different luminaries including Incandescent lamp, Mercury vapor lamps,
   fluorescent tube, CFL, and LED lamps.
11 Polarity and Ratio Test for single Phase Transformer.
12 Pre-determination of efficiency and regulation by Open Circuit and Short circuittests
   on single phase transformer.
13 Determine the Efficiency of single Phase Transformer by Direct Loading Test

Reference books:
   a. P.V.Prasad and S.Shivan Raju – Electrical Engineering
       concepts andApplications – Cengage learning.
   b. B.L.Theraja – Electrical Technology vol.1. – S.Chand.
   c. B.L.Theraja – Electrical Technology vol.2. – S.Chand.
   d. NagrathI.J. and D.P.kothari – Basic Electrical Engineering(2001)
       – TataMcGraw Hill.
   e. .Bharati Dwivedi and Anurasg Tripathi – Fundamentals of

Sr. No	Sem.	Code No.	Subject	Credits
4	II	ESC-P-204	Basic Civil Engineering	4

COs:

At the end of this course, student will be able
1 Describe relevance of Civil Engineering.
2 List different building components.
3 Identify significance of building system.
4 Demonstrate the use of different survey instruments for the field operations.
5 Illustrate surveying problems.
6 Classify various branches of Civil Engineering such as Transportation, Environmental and Irrigation.

Syllabus:

Course	Teaching Scheme					Evaluation Scheme				
						Theory(Marks)		Practical(Marks)		
	L	T	P	Credit	Scheme	Max.	Min. for Passing	Max.	Min. for Passing
Basic Civil Engineering	03	-	02	04	ISE	-	-	25	40%
					MSE	30	40%	-	-
					ESE	70	40%	-	-

ISE: In Semester Evaluation   MSE: Mid Semester Evaluation   ESE: End Semester Evaluation

SECTION I
Unit 1: Relevance of Civil Engineering and Building Planning(7)
Introduction, branches of civil engineering, application of civil engineering in other allied fields.
Principles of planning, introduction to Bye-Laws regarding building line, height of building, open space requirements, F.S.I., setbacks, ventilation, sanitation as per municipal corporation area requirement.

Unit 2: Components of Building (7)
C) Sub-structure: Types of soil and rocks as foundation strata, concept of bearing capacity, types of foundations i.e. shallow and deep and their suitability. Shallow foundation such as wall foundation, isolated foundation, deep foundation such as pile foundation.
D) Super-structure: Elements of super-structures and their functions

Unit 3: Building Materials and Design (7)
Use and properties of the following materials--Concrete – ingredients and grades, plain and reinforcedcement concrete and ready mix concrete, bricks, steel, timber, roofing materials etc.
Introduction to types of loads, load bearing and framed structures.

SECTION II
Unit 4: Linear and Angular Measurements(7)
Principles of surveying, Classification of surveys, Chain Surveying, Introduction to metric chain

and tapes, error in chaining, nominal scale and R.F., ranging, chaining and offsetting, index plan, location sketch and recording of field book, Chain and compass survey, Meridian, bearing and its types, systemof bearing, Types of compass: prismatic and surveyor's compass. Calculation Ofincluded angles, correction for local attraction.

Unit 5: Leveling (7)
Terms used in leveling, use of Dumpy level and Auto Level, temporary adjustments. Methods of reduction of levels, types of leveling, Contours, characteristics of contours, use of contour maps.Introduction and use of EDM's with special reference to Total Station.Measurement of area by planimeter – mechanical and digital.

Unit 6: Introduction to Transportation, Environmental and Irrigation Engineering (7)
Components of rigid and flexible pavement, components of railway track (Broad Gauge)Components ofwater supply scheme (flow diagram), Necessity of Irrigation, Types of Dams (Earthen and Gravity Dam)

Term work:
Student can choose either Model A or Model B for performing practicalModel A
List of Experiments: Minimum 8 experiments should be performed from the following list-Practical exercises given be carried out and drawing sheets be plotted wherever necessary.
 1 Introduction to Measurement of Distances.
 2 Plotting the outlines of building by chaining, ranging and offsetting.

 3 Plotting of closed traverse by prismatic compass.
 4 Reduction of levels by rise and fall method.
 5 Finding out gradient of line by rise and fall method
 6 Measurement of area by mechanical
 7 Study of total station for various measurements.
 8 Site visit to study various construction processes and principles of planning.
 9 Drawing sheet showing various building elements.
10 Drawing sheet showing various sign conventions

   Model B
 List of Experiments: Minimum 8 experiments should be performed from the following list-Practical exercises given be carried out and drawing sheets be plotted wherever necessary.
1 Introduction to Measurement of Distances.
2 Plotting the outlines of building by chaining, ranging and offsetting.
3 Plotting of closed traverse by surveyor's compass.
4 Reduction of levels by collimation plane method.
5 Finding out gradient of line by collimation plane method.
6 Measurement of area by digital planimeter
7 Study of total station for various measurements.
8 Site visit to study various construction processes and principles of planning.
9 Drawing sheet showing various building elements.
10 Drawing sheet showing various sign conventions

   Reference Books:
1 Basic Civil Engineering by S. S. Bhavikatti, New Age International Publications.
2 Civil Engineering Materials - Technical Teacher's Training Institute, Chandigarh
3 Surveying by N. Basak, Tata Mc-Graw Hill Publication.
4 Basic Civil Engineeringby G. K. Hiraskar, DhanpatRai Publication.

5 Surveying Vol.I, Vol.II, Vol.III by B.C. Punmia, Laxmi Publication.
6 Irrigation Engineering by B. C. Punmia, DhanpatRai Publications

Sr. No	Sem.	Code No.	Subject	Credits
5	II	ESC-P-105	Engineering Graphics	4

CO`s:

At the end of this course, student will be able to
1 Draw engineering curves, loci of points and projections of lines and planes.
2 Visualize and draw the projection of regular solids, different cut models of regular solids.
3 Visualize, interpret and draw orthographic views from given pictorial view and Isometric view from given orthographic views.
4 Develop the lateral surfaces of various solids and understand its engineering.

Syllabus:

Course	Teaching Scheme					Evaluation Scheme			
						Theory(Marks)		Practical(Marks)	
	L	T	P	Credit	Scheme	Max.	Min. for Passing	Max.	Min. for Passing
Engineering Graphics	03	-	02	04	ISE	-	-	25	40%
					MSE	30	40%	-	-
					ESE	70	40%	-	-

ISE: In Semester Evaluation   MSE: Mid Semester Evaluation   ESE: End Semester Evaluation

Unit1: Fundamentals of Engineering Graphics& Engineering Curves   (6)
A) Fundamentals of Engineering Graphics: Introduction to Drawing instruments and their uses. Layout of drawing sheets, different types of lines used in drawing practice, Dimensioning system as per BIS (Theoretical treatment only)
B) Engineering curves: Construction of regular polygons (up to hexagon). Construction of Ellipse – (Directrix-Focus & Arcs of circle Method) Parabola-(Directrix-Focus & Rectangle Method) , Hyperbola-(Directrix-Focus & Rectangular Method), Involutes, Archimedian spiral and Cycloid only. (10 marks)

Unit 2: Projections of lines & Planes   (9)
A) Projections of lines: Introduction to First angle and third angle methods of projection.
Projections of points on regular reference planes. Projections of horizontal, frontal and Profile lines on regular and auxiliary reference planes. Projection of oblique lines it's True length and angle with reference planes by rotation and auxiliary plane method. Concept of grade and bearing of line.
B) Projections of planes: Projections on regular and on auxiliary reference planes. Types of planes (horizontal, frontal, oblique and Profile planes). Edge view and True shape of a Plane. Angles made by the plane with Principle reference planes. Projections of plane figures

inclined to both the planes. (Circleand regular polygon) (15 marks)

Unit 3: Projections of solids   (5)
Projections of Prisms, Pyramids, Cylinder and Cones inclined to both reference planes(Excluding frustum and sphere)(10 marks)

SECTION- II
Unit 4: Orthographic Projections   (7)
Orthographic views: lines used, Selection of views, spacing of views, dimensioning and sections. Drawing required views (any two views) from given pictorial views (Conversion of pictorial view into orthographic view) including sectional orthographic view. (15 marks)

Unit 5: Isometric projections   (6)
Isometric projections: Introduction to isometric, Isometric scale, Isometric projections and Isometric views / drawings. Circles in isometric view. Isometric views of simple solids and objects. (10 marks)

Unit 6: Development of plane and curved surfaces   (7)
Development of plane and curved surfaces: of the solids, Prisms, Pyramids, Cylinders and Cones along with cutting planes (Solids in simple position only). (10 marks)

SECTION I

Note: The above syllabus is to be covered according to the first angle method of projection.
Self-Study: Geometrical constructions and free hand sketches**,** Missing Views

 Term work:
  The following six sheets are to be drawn based on the above topics. All these
   sheets shouldbe drawn on half imperial (A3 size) drawing sheets only.
  1 Engineering curves   01
  2 Projections of lines and planes   01
  3 Projections of solids   01
  4 Orthographic projections   01
  5 Isometric projections   01
  6 Sections of solids and development of surfaces   01

Reference Books:
1   Engineering Drawingby N. D. Bhatt, Charotor Publication House, Bombay
2   Fundamentals of Engineering by W. J. Luzadder, Drawing, Prentice Hall of India.
3   Engineering Design and Visualization by Jon M.Duff,William A. Ross, CENGAGE Learning
4   Machine Drawing by N. D. Bhatt, Charotor Publication House, Bombay.
5   Graphic Science by French and Vierck, Mc-Graw Hill International.
6   Engineering Drawing and Graphics by K. Venugopal, New Age Publication
7   A text book of Engineering Drawing by R. K. Dhawan, S. Chand and Co.
8   Machine Drawing by K. L. Narayana, New Age Publication
9   Engineering Drawing by N. B. Shaha and B. C. Rana, Pearson Education.
10 Engineering Drawing and Graphics Using AutoCAD by T. Jeyapoovan, Vikas Publication.
11 Engineering Drawing by Prof. Amar Pathak, WIELY India Publication.

Sr. No	Sem.	Code No.	Subject	Credits
6	II	HM-II-206	Professional Communication-II	2

COs:

At the end of course the student should be able to:

1. Define various types of technical reports.
2. Illustrate positive attitude, time and stress management.
3. Demonstrate the students present yourself professionally.
4. Understand corporate manners, planning and managing career.
5. Demonstrate the group discussion, debate and interview.

Syllabus:

Course	Teaching Scheme					Evaluation Scheme			
						Theory(Marks)		Practical(Marks)	
	L	T	P	Credit	Scheme	Max.	Min. for Passing	Max.	Min. for passing
Professional Communication-II	01	-	02	02	ISE	-	-	25	40%
					MSE	-	-	-	-
					ESE	-	-	-	-

ISE: In Semester Evaluation MSE: Mid Semester Evaluation ESE: End Semester Evaluation

Unit 1: Developing Writing Skills(3)
1 Importance of technical writing
2 Report Writing:
d) Techniques of Report Writing
e) Methods of data collection
f) Types of Report Writing- Survey, Inspection and Investigation

Unit 2: Behavioral Skills(5)
1 Understanding Self (SWOT analysis)
2 Attitude Building/ Developing Positive attitude
3 Decision Making Skills
4 Leadership Skills
5 Stress Management
6 Time Management
7 Team Work

Unit 3: Presentation Skills(2)
1 Importance & techniques
2 Presenting yourself professionally

Unit 4: Career skills (4)
1 Corporate Manners and Etiquettes
2 Planning and Managing Career
3 Job Application and Resume
4 Interview: Techniques& skills
5 Group Discussion

6 Debate

Term Work: Any 8 out of the following should be conducted
1 Group Discussion (lab session/class room activity)
2 Mock Interview
3 Report writing (lab session/class room activity)
4 Paragraph writing on current technical writing
5 Presentation on current affairs
6 Developing Professional Telephonic skills
7 Exercise of Application writing and Resume writing
8 Practice of Case Study
9 Team building activities
10 Report writing (3 types)
11 Introduction and use of modern communication techniques
12 Computer aided presentation of a project report (PPT)

Instructions:
1 Minimum 7 assignments should be covered.
2 Use of language lab is mandatory for both the semesters.

Reference Books:
1 Handbook for Technical Writingby David A. McMurrey, Joanne Buckley, Cengage.
2 A Course in Englishby J.D. O'Connor.
3 Better English Pronunciation by J.D. O'Connor.
4 Communication Skills Handbook: How to succeed in written and oral communication by Jane Summers, Brette Smith, Wiley India Pvt.Ltd.
5 Personal Development for Life and Work by Masters, Wallace, Cengage.
6 Soft Skills for Managers by Dr. T. KalyanaChakravarthi, Dr. T. LathaChakravarthi,Biztantra.
7 Soft Skills for every one by Jeff Butterfield, Cengage.
8 Behavioural Science by Dr.Abha Singh, Wiley India Pvt.Ltd.
9 An Introduction to Professional English and Soft Skills by Bikram K. Das, KalyaniSamantray,Cambridge University Press New Delhi.
10 Speaking Accurately, K.C. Nambiar, Cambridge University Press New Delhi.
11 Speaking Effectivelyby Jeremy Comfort, Pamela Rogerson, Cambridge University PressNew Delhi.
12 Cambridge English for Job Hunting by ColmDownes, Cambridge University Press NewDelhi.
13 Body Language by Allen Pease.
14 The Ace of Soft Skills by Gopalswami Ramesh, Mahadevan Ramesh, PearsonPublication, Delhi.
15 Decision Making Skills by Khanka S.S.
16 Business Ethics and Communication by C.S. TejpalSheth.
17 Write Right by Syed AbdurRaheem.

Sr. No	Sem.	Code No.	Subject	Credits
7	II	ESC-W-II-207	Workshop Practice-II	2

Syllabus:

Course	Teaching Scheme					Evaluation Scheme			
						Theory(Marks)		Practical(Marks)	
	L	T	P	Credit	Scheme	Max.	Min. for Passing	Max.	Min. for passing
Workshop Practice-II	01	-	02	02	ISE	-	-	25	40%
					MSE	-	-	-	-
					ESE	-	-	-	-

ISE: In Semester Evaluation   MSE: Mid Semester Evaluation   ESE: End Semester Evaluation

Unit 1: Welding (4)
Types of welding – gas welding, arc welding, resistance welding, Welding equipment's,welding ofvarious metals, electrode classification and coding, welding joints.

Unit 2: Carpentry (4)
Introduction, Classifications of wood, common varieties of Indian timber, carpentry toolslike-Marking tools, cutting tools, planes, striking tools, holding tools. Carpentry operations-marking,sawing,chiseling,grooving etc. carpentry joints.

Unit 3: Sheet metal work (4)
Specifications of metal sheets, working tools, sheet metal operations like-cutting, bending,folding,punching, reverting and joining by brazing and soldering.

Unit 4: Air pollution: (2)
Air pollution due to automobiles, causes, PUC testing.

Term work:
The term work consists of assignment on Welding, Carpentry, Sheet metal work, Airpollution.Every student should perform---

4. Welding: One job on Arc welding- Lap / Butt Joint etc. (For individual student)OR

Table, Shoe stand, Bag stand etc. (For 4-6 students)

5. Carpentry :One composite job involving dovetail joint, T joint, cross halving joint, pen standetc.(Forindividual student)

OR

Table, Teapot, Stool etc. (For 4-6 students)

6. Sheet metal Work:

One job on commercial items such as Dust bin, funnel, tray etc.

Reference Books:
1 A Course in Workshop Technology, Vol – I by B. S. Raghuvanshi, Dhanapat Rai and Sons.
2 Elements of Workshop Technology, Vol – I by HajaraChaudhari, Media Promoters.
3 Workshop Technology, Vol – I by Gupta and Kaushik, New Heights.
4 Workshop Technology, Vol – I by Chapman, The English Language Book Society.
5 Workshop technology, Vol.-I by H.S. Bawa, TMH Publications, New Delhi.
6 I.C. Engines by Mathur& Sharma, Dhanpat Rai Publications, New Delhi.