

Punyashlok Ahilyadevi Holkar Solapur University, Solapur



Name of the Faculty: Science & Technology

New Education Policy 2020

Syllabus: First Year B. Tech. (All Branches)

Name of the Course: F. Y. B. Tech. (Sem.– I & II)

(Syllabus to be implemented from June 2023)



PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

FACULTY OF SCIENCE & TECHNOLOGY

NEP Compliant CBCS Curriculum for First Year B. Tech. (All Branches)

With effect from 2023-2024

Semester I:

Course Type	Course Code	Name of the Course	Engagement Hours		Credits	FA	SA		Total
			L	P		ESE	ISE	ICA	
BSC	BSC-01/ BSC-02	Engineering Physics / Engineering Chemistry \$	3	2	4	70	30	25	125
	BSC-03	Engineering Mathematics-I	3	2	4	70	30	25	125
ESC	ESC-01/ ESC-02	Basics of Civil and Mechanical Engineering / Basic Electrical & Electronics Engineering #	3	2	4	70	30	25	125
	ESC-03	Engineering Mechanics	3	2	4	70	30	25	125
AEC	AEC-01	Communication Skills	1	2	2	-	25	25	50
CC	CC-01	Sports and Yoga or NSS / NCC / UBA (Liberal Learning Course-I)	1	2	2	-	-	25	25
SEC	SEC-01	Workshop Practices	-	2	1	-	-	25	25
Total			14	14	21	280	145	175	600
Student Induction Program**									

Semester II

Course Type	Course Code	Name of the Course	Engagement Hours		Credits	FA	SA		Total
			L	P		ESE	ISE	ICA	
BSC	BSC-01/ BSC-02	Engineering Physics / Engineering Chemistry \$	3	2	4	70	30	25	125
	BSC-04	Engineering Mathematics - II	3	2	4	70	30	25	125
ESC	ESC-01/ ESC-02	Basics of Civil and Mechanical Engineering / Basic Electrical & Electronics Engineering #	3	2	4	70	30	25	125
	ESC-04	Engineering Graphics and CAD	-	4	2	-	25	50	75
SEC	SEC-02	Data Analysis and Programming Skills	1	2	2	-	25	25	50
CC	CC-02	Professional Personality Development (Liberal Learning Course-II)	1	2	2	-	25	25	50
IKS	IKS-01	Introduction to Indian Knowledge System	2	-	2	-	25	25*	50
Total			13	14	20	210	190	200	600
Democracy, Elections and Good Governance *			1			50			

***For IKS activity report should be submitted**

BSC- Basic Science Course **ESC-** Engineering Science Course, **PCC-** Programme Core Course ,

AEC- Ability Enhancement Course, **IKS-** Indian Knowledge System, **CC-** Co-curricular Courses ,
VSEC- Vocational and Skill Enhancement Course

- Notations used–

L : Lecture	P : Lab Sessions
FA : Formative Assessment	SA : Summative Assessment
ESE : End Semester Examination	ISE : In Semester Evaluation
ICA : Internal Continuous Assessment	

- **Notes-**

1. \$ - Indicates student may choose Engineering Physics or Engineering Chemistry in either first or second semester. Those who have taken Engineering Physics in first semester will take Engineering Chemistry in second semester. Those who have taken Engineering Chemistry in first semester will take Engineering Physics in second semester.
2. # - Indicates student may choose Basics of Civil and Mechanical Engineering or Basic Electrical & Electronics Engineering in either first or second semester. Those who have taken Basics of Civil and Mechanical Engineering in first semester will take Basic Electrical & Electronics Engineering in second semester. Those who have taken Basic Electrical & Electronics Engineering in first semester will take Basics of Civil and Mechanical Engineering in second semester.
3. For the Course Basic Electrical & Electronics Engineering, practical of Basic Electrical Engineering and Basic Electronics Engineering will be conducted in alternate weeks.
4. For the Course Basics of Civil and Mechanical Engineering, practical of Basics of Civil Engineering and Basics of Mechanical Engineering will be conducted in alternate weeks.
5. In Semester Evaluation (ISE) marks shall be based upon student's performance in three tests conducted & evaluated at institute level.
6. Internal Continuous Assessment Marks (ICA) is calculated based upon student's performance during practical sessions.
7. *- Democracy, Elections & Good Governance is mandatory course. The marks earned by student with this course shall not be considered for calculation of SGPA/CGPA. However, student must complete End Semester Examination (ESE) of 50 marks (as prescribed by university) for fulfillment of this course. This course is not considered as a passing head for counting passing heads for ATKIT. However, student must pass this subject for award of the degree.
8. Student must complete induction program of minimum five days before commencement of the regular academic schedule at the first semester.

**** GUIDELINES FOR STUDENT INDUCTION PROGRAM**

New entrants into an Engineering program come with diverse thoughts, mind set and different social, economic, regional and cultural backgrounds. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose.

An induction program for the new UG entrant students is proposed at the commencement of the first semester. It is expected to complete this induction program before commencement of the regular academic schedule.

Its purpose is to make new entrants comfortable in their new environment, open them up, set a healthy daily routine for them, create bonding amongst the peers as well as between faculty and students,

develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

The Induction Program shall encompass (but not limited to) below activity –

1. Physical Activities
2. Creative Arts
3. Exposure to Universal Human Values
4. Literary Activities
5. Proficiency Modules
6. Lectures by Experts / Eminent Persons
7. Visit to Local Establishments like Hospital /Orphanage
8. Familiarization to Department

Induction Program Course do not have any marks or credits however performance of students for Induction Program is assessed at institute level using below mandatory criteria –

1. Attendance and active participation
2. Report writing



Punyashlok Ahilyadevi Holkar Solapur University, Solapur

First Year B. Tech. (All Branches) Semester-I/II

BSC-01 ENGINEERING PHYSICS

(w.e.f. 2023-24)

Teaching Scheme

Theory - 3 Hrs/Week, 3 Credits

Laboratory - 2 Hrs/Week, 1 Credit

Examination Scheme

Theory - ESE- 70 Marks

ISE- 30 Marks

ICA - 25 Marks

- **Course Objectives:**

BSC-01.01	To make students understand the categorization of solids based on band theory, ideas of Fermi level position in semiconductors.
BSC-01.02	To prepare students understand the different structures of solids and its characterizations.
BSC-01.03	To introduce students sound engineering through basic concepts of acoustics and ultrasonic.
BSC-01.04	To make students recall and discuss the concepts of wave optics via diffraction and polarization phenomenon.
BSC-01.05	To prepare students comprehend basics and working of LASER.
BSC-01.06	To prepare students understand the fundamentals of optical fiber and Nanoscience

- **Course Outcomes:**

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

BSC-01.1	Understand the concepts of semiconductors to implement in Engineering field.
BSC-01.2	Analyze the structural properties of elemental solids.
BSC-01.3	Apply concepts of acoustics and ultrasonic in various Engineering instruments.
BSC-01.4	Implement diffraction and polarization phenomenon to design advanced optical instruments.
BSC-01.5	Understand the fundamentals, construction and working of Laser in order to apply this Technology in Engineering fields.
BSC-01.6	Understand the basics of optical fiber and Nanoscience to implement in Engineering.

- **Course Curriculum:**

Section-I

Unit No. 01: Semiconductor Physics		Hours: 07		Marks: 16	
<i>Sr. No.</i>	<i>Subunit</i>	<i>Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
1.1	Introduction to band theory of solids, Classification of solids, Fermi level (definition), Fermi-Dirac distribution function (introduction only)	4	3	Explanation, Definition, Classification	Remembering, Understanding
1.2	Fermi level in intrinsic and extrinsic semiconductors, effect of impurity concentration on Fermi level, Derivation for E_{Fin}	4	2	Explanation, Derivation	Remembering, Understanding
1.3	Hall Effect and applications	5	1	Derivation	Understanding
1.4	Numerical(s)	3	1	Numerical	Applying

Unit No. 02: Structure of Solids and its characterization		Hours: 08		Marks: 19	
<i>Sr. No.</i>	<i>Subunit</i>	<i>Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
2.1	Introduction to crystal systems, characteristics of cubic unit cell: number of atoms per unit cell, atomic radius, co-ordination number	5	3	Explanation, Definition	Remembering, Understanding
2.2	Atomic packing factor, void space, density of crystal, Bragg's Law	3	2	Explanation, Describe	Remembering, Understanding
2.3	Symmetry elements (axis, center and plane)	5	1	Explanation, Describe	Remembering, Understanding
2.4	Miller indices, inter planner distance (by using Miller indices)		1	Derivation	Remembering, Understanding
2.5	Numerical(s)	6	1	Numerical	Applying

Unit No. 03: Sound Engineering		Hours: 06		Marks: 16	
<i>Sr. No.</i>	<i>Subunit</i>	<i>Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
3.1	Acoustics: Introduction, reverberation, reverberation time, absorption coefficient (definition only), Sabine's formula, basic requirements for acoustically good hall	4	2	Explanation, State/Define	Remembering, Understanding, Applying
3.2	Factors affecting acoustics of auditorium and their remedies,	5	1	Explanation	Remembering, Understanding
3.3	Numerical(s)	3	1	Numerical	Applying
3.4	Ultrasonic: Introduction, piezoelectric effect and magnetostriction effect (introduction), Properties of ultrasonic waves, Detection methods of ultrasonics and its applications	4	2	Explanation, State	Remembering, Understanding

Section-II

Unit No. 04: Wave Optics		Hours: 08		Marks: 19	
<i>Sr. No.</i>	<i>Subunit</i>	<i>Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
4.1	Diffraction: Introduction, resolving power, Rayleigh criterion, theory of diffraction grating.	4	3	Explanation, State/Define	Remembering, Understanding
4.2	Resolving power of diffraction grating	5*	1	Explanation	Understanding, Applying
4.3	Polarization: concept, optic axis, Malus law, positive and negative crystals, Optical activity, specific rotation	4	2	Explanation, State/Define	Remembering, Understanding
4.4	Laurent's half shade Polarimeter	5*	1	Explanation	Understanding, Applying
4.5	Numerical(s)	6	1	Numerical	Applying

*- indicates single count.

Unit No. 05: LASER		Hours: 06		Marks: 14	
<i>Sr. No.</i>	<i>Subunit</i>	<i>Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
5.1	Interaction of radiation with matter-Stimulated absorption, spontaneous and stimulated emission, population inversion, pumping, metastable state, properties of laser	6	3	Explanation, State/Define	Remembering, Understanding
5.2	He-Ne gas laser: Construction, working on energy level	5	2	Explanation, Describe	Understanding, Applying
5.3	Holography (construction and reconstruction), applications of laser (science, engineering and medical)	3	1	Explanation	Remembering, Understanding

Unit No. 06: Optical Fiber and Nanoscience		Hours: 07		Marks: 18	
<i>Sr. No.</i>	<i>Subunit</i>	<i>Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
6.1	Introduction, structure of optical fiber, basic principle of optical fiber (Total Internal Reflection)	4	2	Explanation, State/Define	Remembering, Understanding
6.2	Classification of optical fibers-step and graded index fibers, advantages of optical fibers over conducting wires		1	Explanation, Classification	Remembering, Understanding
6.3	Derivation for acceptance angle, acceptance cone and numerical aperture, fractional refractive index change	5	1	Derivation	Remembering, Understanding
6.4	Numerical(s)	6	1	Numerical	Applying
6.5	Nanotechnology: Introduction, carbon Nanotubes and its classification, applications of nanotechnology (electronics, energy, automobiles, space and defence, medical, cosmetics, environmental)	3	2	Explanation, State/Define	Remembering, Understanding

- **In Semester Evaluation (ISE):**

In Semester Evaluation (ISE) marks shall be based upon student's performance in three tests conducted & evaluated at institute level.

- **Internal Continuous Assessment (ICA):**

Internal Continuous Assessment (ICA) marks are calculated based on student's performance during laboratory sessions (minimum **eight** experiments out of below list).

1. Measurement of band gap energy of a semiconductor diode.
2. To determine Hall coefficient and charge carrier concentration by Hall Effect.
3. Study of Crystal structures.
4. Determination of velocity of sound using Kundt's tube apparatus.
5. Determination of wavelength of light by using diffraction grating.
6. Resolving power of a telescope/ diffraction grating.
7. Verification of inverse square law of intensity of light (Malus law).
8. To determine specific rotation by using Laurent's Half Shade Polarimeter.
9. Calculation of divergence of LASER beam.
10. Determination of wavelength of LASER using diffraction grating.
11. Determination of inter-planar distance 'd' using XRD pattern.
12. Study of Fiber optics.
13. To determine the Numerical Aperture of the optical fiber.

- **Text / Reference Books:**

1. Engineering Physics, R. K. Gaur and S.L. Gupta, Dhanapat Rai Publications
2. A Text Book of Engineering Physics, M.N. Avadhanulu, P.G. Kshirsagar, S. Chand and Company Ltd.
3. Modern Physics, B.L. Theraja, S. Chand and Company Ltd.
4. A Text Book of Optics, Subramanya and BrijLal, S. Chand and Company Ltd.
5. Nanotechnology: Principles and Practices, Sulabha K. Kulkarni, Capital Publishing Company
6. Nanoscience and Nanotechnology: Fundamentals to Frontiers –M.S. Ramachandra Rao, Shubra Singh, Wiley India Pvt Ltd, New Delhi
7. Engineering Physics, D.K. Bhattacharya, Poonam Tandon, Oxford University Press
8. Solid State Physics, S.O. Pillai, McGraw Hill Publications



P. A. H. Solapur University, Solapur
First Year B. Tech (All Branches) Semester-I/II

BSC-02 ENGINEERING CHEMISTRY

Teaching Scheme

Theory – 3Hrs. /Week,3Credits

Laboratory – 2 Hrs./Week,1Credit

Examination Scheme

ESE- 70Marks

ISE –30Marks

ICA-25Marks

• **Course Objectives:**

BSC-02.O1	To impart knowledge of importance of quality of water and appropriate water treatment process
BSC-02.O2	To impart knowledge of corrosion & its prevention techniques
BSC-02.O3	To impart knowledge of lubrication and properties of lubrication.
BSC-02.O4	To impart knowledge of quality of fuel and scope of alternate energy sources.
BSC-02.O5	To make students apply knowledge of different polymeric materials.
BSC-02.O6	To equip students with the required analytical skills

• **Course Outcomes:** At the end of this course, students will able to

BSC-02.1	Analyse the water quality and interpret techniques for water purification.
BSC-02.2	Describe lubrication and properties of lubricants, select proper lubricant for specific machine.
BSC-02.3	Explain mechanism of the corrosion, select proper preventive methods of corrosion.
BSC-02.4	Recognize the fuel quality and understand the scope of alternate energy sources.
BSC-02.5	Interpret the chemical synthesis, properties of various polymers and their applications.
BSC-02.6	Describe various types of energy storage systems with their applications.

Section-I

Unit No. 01: Water Chemistry				Hours :08	Marks: 18
<i>Sr. No.</i>	<i>Subunit</i>	<i>Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
1.1	Introduction, water quality parameters like pH, acidity, alkalinity, total solids, Dissolved oxygen, chlorides (definitions & permissible limits as per BIS), BOD, COD, (Definition, Determination & Significance).	3	2	Explanation	Understanding remembering
1.2	Hardness: types of hardness (temporary/ permanent), Calcium carbonate equivalent hardness and its calculations. (Numerical problems on hardness),	4	2	Explanation, numerical	Remembering, understanding, applying
1.3	Scale and sludge in boilers: Formation, disadvantages and prevention. Softening of water by Ion exchange process and reverse osmosis process.	6	2	Explanation	Understanding, remembering
1.4	Treatment of water for domestic purpose by aeration, sedimentation with coagulation process. Disinfection of water by chloramine, bleaching powder, chlorine and ozone.	5	2	Explanation, applications	Remembering, understanding
Unit No. 02: Lubricants				Hours: 05	Marks:13
<i>Sr. No.</i>	<i>Subunit</i>	<i>Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
2.1	Lubricants & lubrication, functions, classification of lubricants: Solid, semisolid and liquid.	3	1	Explanation	Remembering, understanding
2.2	Characteristic properties of lubricants (only definition) such as viscosity, viscosity index, flash point & fire point, cloud point & pour point, aniline point, oiliness, saponification value & acid value (numerical problems on saponification & acid value)	5	2	Explanation, numerical	Remembering, understanding, applying
2.3	Types of lubrication such as fluid film, boundary (thin film) and extreme pressure. Selection of lubricants for cutting tools, I.C. engine, gears, transformers, delicate instruments & refrigeration system.	5	2	Explanation application	Remembering, understanding

Unit No. 03: Metallic Materials, Corrosion & its Prevention				Hours : 08	Marks:18
Sr. No.	Subunit	Marks	Hours	Assessment	Bloom's Level
3.1	<i>Metallic Materials:</i> types of iron: cast iron, steel and wrought iron: composition, properties and applications. <i>Alloys:</i> definition, purposes of making alloys.	4	2	Explanation, application	Remembering, understanding
3.2	<i>Corrosion:</i> definition, classification <i>Dry corrosion:</i> oxidation corrosion: nature of oxide film. <i>Wet corrosion</i> – electrochemical corrosion: Hydrogen evolution mechanism, oxygen absorption mechanism.	5	2	Explanation	Remembering, understanding
3.3	Factors influencing corrosion, testing and measurement of corrosion by weight loss method and electrical resistance method	4	2	Explanation	Remembering, understanding
3.4	<i>Prevention of corrosion by:</i> <i>Cathodic protection & anodic protection</i> <i>Protective coatings:</i> <i>Metal Coating:</i> methods of application of metal coatings such as hot dipping (galvanization & tinning), metal cladding. <i>Organic Coating:</i> Paint: characteristics of good paints, constituents of paints.	5	2	Explanation	Remembering, understanding

Section-II

Unit No. 04: Conventional & Non-conventional Energy Sources				Hours:09	Marks:21
Sr. No.	Subunit	Marks	Hours	Assessment	Bloom's Level
4.1	Introduction, classification, characteristics of good fuel, comparison between solid, liquid and gaseous fuel, calorific value (gross and net),	4	2	Explanation,	Remembering, understanding,
4.2	Determination of calorific value by bomb calorimeter and Boy's calorimeter. Dulong's formula for calorific value. (numerical problems on calorific value.)	8	3	Explanation, Application, Numerical	Remembering, understanding, Applying
4.3	Petroleum: introduction, composition, classification, origin, refining of crude oil. <i>Biodiesel:</i> Introduction, preparation, advantages and disadvantages.	5	2	Explanation	Remembering, understanding
4.4	Batteries – Introduction and types of batteries, characteristics of batteries, construction, working and applications of Lithium ion batteries, charging and discharging reactions at respective electrodes.	4	2	Explanation	Remembering, understanding

Unit No. 05: Polymers				Hours :08	Marks:18
Sr. No.	Subunit	Marks	Hours	Assessment	Bloom's Level
5.1	Polymerization, types of polymerization, degree of polymerization (DP), numerical problems on degree of polymerization, number average molecular weight (definitions and numerical problems)	6	2	Explanation, application, numerical	Remembering, understanding, applying
5.2	<i>Plastics</i> : definition, properties, types of plastics (thermosoftening and thermosetting), synthesis, properties and applications of PVC and PET, molding of plastic into articles: compression, extrusion and injection & transfer.	6	3	Explanation, application	Remembering, understanding
5.3	<i>Rubber</i> : Classification, isolation of natural rubber, vulcanization, synthesis, properties and applications of Buna-S and Thiokol rubbers. <i>Biodegradable Polymers</i> : Introduction, examples with applications.	6	3	Explanation, application	Remembering, understanding
Unit No. 06: Modern Analytical Techniques				Hours:04	Marks:10
Sr. No.	Subunit	Marks	Hours	Assessment	Bloom's Level
6.1	<i>Concentration of solution</i> :- Normality, molarity, molarity, mole fraction (definition and numerical problems),	4	2	Explanation, application, numerical	Remembering, understanding, applying
6.2	<i>Chromatography</i> : definition, types. <i>GLC</i> : definition, instrumentation and application of GLC. <i>Thermal analysis</i> : definition of TGA, instrumentation and application of TGA.	6	2	Explanation	Remembering, understanding

- **In Semester Evaluation (ISE):**

ISE shall be based upon student's performance in three tests conducted & evaluated at institute level

- **Internal Continuous Assessment (ICA):**

ICA shall be based on minimum **Eight** experiments out of below list

1. Determination of Hardness of water.
2. Determination of Alkalinity of water.
3. Determination of Chloride content in given water.
4. Determination of dissolved oxygen in water.
5. Determination of viscosity of a lubricant by Ostwald's viscometer.
6. Estimation of Copper in Bronze metal alloy.
7. Preparation of phenol formaldehyde resin.
8. Preparation of urea Formaldehyde resin.
9. Determination of COD of water sample.

10. Separation of mixture of organic compounds by TLC.
11. Determination of oil and grease from waste water.
12. Hands on Determination of pH by pH meter.
13. Hands on Determination of EMF of acid base titration by potentiometer.

Books:

1. A text book of Engineering Chemistry, S.S. Dara, S S Umare, S Chand
2. A text book of Engineering Chemistry, Shashi Chawala, Dhanpat Rai & Co
3. A text book of Experiments and Calculations in Engineering Chemistry, S.S. Dara. S Chand

Reference Books:

1. Engineering Chemistry, Jain and Jain, Dhanpat Rai & Co
2. Engineering Chemistry, M. Subha Ramesh, Dr. S. Vairan-Ed.-IInd Wiley
3. Instrumental Methods of chemical analysis, Chatwal and Anand, Himalaya Pub House
4. Industrial Chemistry, B.K. Sharma, Goyal
5. Chemistry for Engineers, Rajesh Agnihotri, Wiley
6. Fundamentals of Engineering Chemistry, S.K.Singh, New AgeInt.
7. Engineering Chemistry (NPTEL Web book), B. L. Tembe, Kamaluddin & M. S.Krishnan.
8. Fuel Cells-Shripad Revankar, Pradeep Majumdar
9. Fuel Cell Fundamentals-Ryan O'Hayre, Suk-Won Cha, John wiley & Sons
10. Recent trends in Fuel Cell Science and Technology-Suddhasatwa Basu, Anamaya Publishers, New Delhi.



P. A. H. Solapur University, Solapur
First Year B. Tech (All Branches) Semester-
I

BSC-03 ENGINEERING MATHEMATICS - I

Teaching Scheme

Theory– 3Hrs. /Week, 3 Credits

Practical– 2 Hrs./Week, 1Credit

Examination Scheme

Theory – ESE- 70Marks

ISE- 30Marks

ICA-25Marks

• **Course Objectives:**

BSC-03.O1	To introduce the students to higher order derivatives of various standard functions and Mean Value Theorems.
BSC-03.O2	To introduce the students to the expansion of functions about any point and to evaluate the indeterminate forms of limits.
BSC-03.O3	To introduce the students to rank of matrix, solution of simultaneous equations, Eigen values and Eigen vectors.
BSC-03.O4	To introduce the student to Multivariable differentiation and its applications.
BSc-03.O5	To introduce the student to vector differentiation and applications.

• **Course Outcomes:**

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

BSC-03.1	Compute higher order derivative of standard functions.
BSC-03.2	Determine the power series expansion of a given function and evaluate limits.
BSC-03.3	Use matrices techniques for solving system simultaneous linear equations , eigen values and eigen vectors of the matrix.
BSC-03.4	Solve multivariable derivative of given functions.
BSC-03.5	Use multivariable derivative to estimate maxima and minima of multivariable function.
BSC-03.6	Compute velocity vector, gradient, divergence, curl and applications.

• Course Curriculum

Section I

Unit No. 01: Successive Differentiation and Mean Value Theorems		Hours : 06		Marks: 13	
<i>Sr.No.</i>	<i>Subunit</i>	<i>Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
1.1	Definition & symbol, nth derivatives of standard functions like e^{ax} , a^{mx} , $(ax + b)^m$, $\frac{1}{ax+b}$, $\frac{1}{(ax+b)^m}$, $\log(ax+b)$, $\sin(ax+b)$, $\cos(ax+b)$, $e^{ax} \sin(bx+c)$ and $e^{ax} \cos(bx+c)$.	01	01	Definition	Remembering
1.2	n^{th} derivatives of algebraic functions, n^{th} derivatives of trigonometric functions	06	02	Determination of n^{th} order derivative	Remembering, understanding, applying
1.3	Statement of Leibnitz's Theorem (without proof), nth derivative of product of two functions by Leibnitz theorem, formation of higher order differential equations for the given functions,	06	03	Determination of n^{th} order derivative	Remembering, understanding, applying
Unit No. 02: Expansion of Functions and Indeterminate forms		Hours : 07		Marks: 19	
<i>Sr. No.</i>	<i>Subunit</i>	<i>Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
2.1	Statement of Maclaurin's series (without proof), expansion of standard functions and examples using Maclaurin's series. Expansion of functions by standard series method, differentiation and integration, method of substitution.	08	03	Numerical example, evaluate	Remembering, understanding, applying
2.2	Statement of Taylor's series (without proof), expansion of functions $f(x)$ about any point	03	01	Numerical example, evaluate	Remembering, applying

2.3	Indeterminate forms of the type $\frac{0}{0}, \frac{\infty}{\infty}, 0 \times \infty, \infty - \infty, 1^\infty, 0^0, \infty^0$ by L_e Hospital's rule.	08	03	Evaluate, applications	Understanding, applying
Unit No 03: Matrices		Hours : 09		Marks: 20	
<i>Sr. No.</i>	<i>Subunit</i>	<i>Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
3.1	Definition of Symmetric, Skew-Symmetric and orthogonal Matrices, Rank of matrix, canonical form or normal form of matrix	03	01	Numerical example, evaluate	Remembering, understanding
3.2	System of Simultaneous Linear Equations - homogeneous and non-homogeneous	05	02	Numerical example, evaluate	Understanding, applying
3.3	Linear dependence and independence of vectors, Cayley - Hamilton Theorem (without proof) Inverse by Cayley Hamilton Theorem	06	03	Definition application	Understanding, applying
3.4	Eigen values , Eigen vectors and their properties	06	03	Definition , determination	Remembering, understanding, applying

Section II

Unit No.04: Multivariable Differential Calculus		Hours:09		Marks: 18	
<i>Sr.No.</i>	<i>Subunit</i>	<i>Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
4.1	Partial(Multivariable) derivatives of first and higher order , variable to be treated as constant	06	03	Evaluate	Remembering, understanding
4.2	Total derivative, Partial(Multivariable) differentiation of composite function	06	03	Determination	Remembering, understanding,
4.3	Homogeneous functions and Euler's Theorem (without proof)	06	03	Applications	Remembering, applying

Unit No. 05 : Applications of Multivariable Differential Calculus		Hours : 07		Marks: 17	
<i>Sr.No.</i>	<i>Subunit</i>	<i>Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>

5.1	Jacobians, properties of Jacobians i.e., $J.J^*=1$, Jacobians of composite functions	05	02	Definition, applications	Remembering, understanding, applying
5.2	Errors and approximations	03	01	Application, numerical example, evaluate	Remembering, understanding, applying
5.3	Maxima & minima of functions of two variables	06	03	Definition, applications	Remembering, understanding, applying
5.4	Lagrange's method of Undetermined multipliers (one condition)	03	01	applications	Understanding, applying
Unit No. 06: Vector Differential Calculus			Hours : 07	Marks: 17	
<i>Sr.No.</i>	<i>Subunit</i>	<i>Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
6.1	Velocity vector, acceleration vector, tangential and normal component of acceleration	03	01	Evaluate	Remembering, understanding,
6.2	Vector differential operator, gradient, directional derivatives, angle between surfaces,	07	03	Evaluate/ numerical	Understanding, applying
6.3	Divergence and curl, solenoidal and irrotational field	07	03	Evaluate/ apply Standard results	Understanding, applying

- **In Semester Evaluation (ISE):**

ISE shall be based upon student's performance in three tests conducted & evaluated at institute level

- **Internal Continuous Assessment (ICA):**

ICA shall be based on student's performance during the laboratory sessions, minimum 6 assignments and on completion of minimum 8 exercises out of the following exercises:

1. Solve any 5 examples on nth derivative of algebraic functions and trigonometric functions.
2. Solve any 5 examples on Leibnitz theorem for formation of higher order differential equations.
3. Solve any 5 examples on expansion of functions by using standard functions.
4. Solve any 5 examples on expansion of functions by using Taylor's series.
5. Solve any 5 examples on L' Hospital's rule.
6. Solve any 5 examples on Rank of matrix using Normal form.
7. Solve any 5 examples on finding eigen values and eigen vectors of matrix.
8. Solve any 5 examples on verify Cayley Hamilton Theorem.
9. Solve any 5 examples on differentiation of composite functions.
10. Solve any 5 examples by using Euler's Theorem and its deductions.
11. Solve any 5 examples on Jacobians.
12. Solve any 5 examples on errors and approximations.

13. Solve any 5 examples on maxima and minima of functions of two variables.
14. Solve any 5 examples on velocity and acceleration.
15. Solve any 5 examples on directional derivative.
16. Solve any 5 examples on solenoidal and irrotational field.

✓ *Note – Students shall be encouraged to use Scilab, R-programming and other software's for solving examples*

- **Text Books:**

1. A Text Book of Applied Mathematics, P.N. and J.N. Wartikar, Vol.1, Pune Vidyarthi Griha Prakashan.
2. Advanced Engineering Mathematics, H. K. Dass, S. Chand Publications, Delhi.
3. Engineering Mathematics (Volume I), ITL Education, Cengage Learning.
4. Engineering Mathematics, Ravish R Sing and Mukul Bhatt, McGraw Hill.
5. Applied Mathematics-I,II, Kreyzig's, Wiley.
6. A text book of Engineering Mathematics, N.P. Bali and Manish Goyal, Laxmi Publications, 2008

- **Reference Books:**

1. Higher Engineering Mathematics (42nd Edition), B.S. Grewal, Khanna Publications, Delhi.
2. Engineering Mathematics, Srimanta Pal and Subodh C. Bhunia, Oxford Higher Education.
3. Mathematics for Engineering Applications, Kuldeep S. Rattan and Naathan W. Klingbeil Wiley. (Modeling and Core Engineering Application)
4. Higher Engineering Mathematics, Ramana B.V., Tata McGraw Hill New Delhi, 2010.



P. A. H. Solapur University, Solapur
First Year B. Tech
(All Branches) Semester-I

ESC-01 BASICS OF CIVIL AND MECHANICAL ENGINEERING

Teaching Scheme

Theory– 4Hrs. /Week, 4 Credits
Laboratory –2 Hrs./Week, 1Credit

Examination Scheme

Theory – ESE- 70Marks
ISE –30Marks
ICA-25Marks

• **Course Objectives:**

ESC-01.O1	To acquaint students with the relevance of Civil Engineering for various applications in different branches of Engineering and Technology
ESC-01.O2	To introduce students to the Environment & Water Resources Management, transportation engineering, various elements of buildings, concepts of Green Buildings, Remote sensing Techniques, GIS & GPS.
ESC-01.O3	To introduce basic streams of mechanical engineering such as Design Engineering, Production Engineering and Thermal Engineering
ESC-01.O4	To make the students identify different mechanical engineering applications in day to day life.

• **Course Outcomes:**

At the end of course, students will be able to

ESC-01.1	Describe the role of civil engineer in the development of the society and Relationship of civil engineering with other branches of engineering and technology.
ESC-01.2	Explain various elements of buildings, concepts of Green Buildings, transportation engineering, Remotesensing Techniques, GIS &GPS..
ESC-01.3	Explain various concepts and application of GIS ,GPS and Remotesensing Techniques..
ESC-01.4	Determine heat and work quantum during different thermodynamic processes and Identify power absorbing/producing devices.
ESC-01.5	Identify suitable power transmission system for different mechanical applications
ESC-01.6	Explain various machining/joining processes implemented in everyday life.

• **Course Curriculum**

Section-I

BASICS OF CIVIL ENGINEERING

Unit No. 01: Introduction to Civil Engineering & Infrastructure				Hours :06	Marks: 11
<i>Sr. No</i>	<i>Subunit</i>	<i>Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
1.1	Definition and various sub domains of civil engineering.	02	01	Explanation	Remembering understanding
1.2	Relevance of Civil Engineering branch with other branches of engineering.	06	04	Explanation	Remembering understanding
1.3	Role of civil engineerI in various construction activities	03	01	Explanation	Remembering, understanding
Unit No 02: Buildings , Green Buildings & Building Services and transportation				Hours : 08	Marks: 14
<i>Sr. No</i>	<i>Subunit</i>	<i>Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
2.1	Superstructure: principle of load transfer, frame action, loads bearing wall action. General idea about substructure,super structure and their various elements and their functions (Foundation types, plinth, lintel, chajja, roof, parapet, spout etc.)	06	04	Definition, Explanation	Remembering, understanding
2.2	Green Building: concept of planning and construction of green building, Sustainable Development. Rain water Harvesting	04	02	Definition, Explanation	Remembering, understanding
2.3	Introduction to roads, IRC classification, typical functional cross sections, Highway Engineering	04	02	Explanation	Remembering, understanding

Unit No 03: Infrastructure, Environmental and Surveying				Hours : 13	Marks: 19
<i>Sr.</i>	<i>Subunit</i>	<i>Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
3.1	Environmental Engineering: Water treatment systems; Effluent treatment systems; Solid waste management , Hydrological cycle	04	03	Definition, explanation	Remembering, understanding
3.2	Definition, general principles of surveying, classification of surveying. Introduction to leveling and contours (Rise and fall, HI method)	10	06	Definition, explanation	Remembering, understanding
3.3	Introduction to Geographic Information system (GIS), Global Positioning System (GPS), Remote sensing with applications	05	04	Explanation	Remembering, understanding

Section-II

BASICS OF MECHANICAL ENGINEERING

Unit No 04: Fundamentals of Thermodynamics & Fluid Machinery Hours: 10 Marks: 24					
<i>Sr. No</i>	<i>Subunit</i>	<i>Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
4.1	Definition of Thermodynamics, thermodynamic Systems,surrounding, universe, types ofsystems, state of system, properties- intensive and extensive, thermodynamic equilibrium, process and cycle, Zeroth Law of thermodynamics	04	02	Explanation	Remembering understanding
4.2	Work and forms of work, heat, first law of thermodynamics, first law applied to flow processes, steady flow process, steady flow energy equation (SFEE) and applications of SFEE),(Numerical on first law of thermodynamics, cyclic and Non-cyclic processes, SFEE), Second Law of Thermodynamics.	09	04	Explanation, derivations, numerical on P-V relations, work done and SFEE applications	Remembering, understanding, applying

4.3	Power absorbing devices Pumps: definition, classification, construction, working and applications of reciprocating pump, centrifugal pump. Compressors: construction, working and applications of reciprocating compressor, rotary compressors (vane blower)	06	03	Definition, explanation	Remembering & Understanding
4.4	Power producing devices Turbines: construction, working and applications of Pelton Wheel, Francis and Kaplan turbines.	05	01	Definition, explanation	Remembering, understanding

Unit No 05: Machine Tools and Joining Processes		Hours: 06		Marks:13	
5.1	Machine tools: Centre lathe – basic elements, construction, working, operations on lathe- (Only turning, facing). Drilling machine - Basic elements of Pillar drilling machine.	05	03	Explanation	Remembering understanding
5.2	Metal Joining Processes: Welding process: definition, Types, Electric arc welding, Spot welding, oxy-acetylene gas welding Introduction to Brazing and Soldering	08	03	Explanation	Remembering understanding

Unit No 06:Power Transmission System			Hours:05	Marks:12	
Sr. No.	Subunit	Marks	Hou rs	Assessment	Bloom 's Level
6.1	Belt drives: open and cross belt drives, materials of belt, types of belts, length of belt for open and cross drive, velocity ratio of simple and compound belt drive, centrifugal tension, maximum power transmitted (numerical on simple belt drive only)	07	03	Explanation, derivations, Numerical on simple belt drives	Remembering Understanding applying
6.2	Other Transmission Systems: chain drive, Gear drive, Types of gears	05	02	Explanation	Remembering, understanding

- **In Semester Evaluation (ISE):**

ISE shall be based upon student's performance in three tests conducted & evaluated at institute level

- **Internal Continuous Assessment**

- **Section-1**

ICA shall include minimum three assignments and experiments as listed below. As a part of the completion of ICA, student shall submit completed Journal at the end of the course.

- **List of Experiments:**

1. Demonstration of various leveling instruments.
2. Simple leveling and Differential leveling
3. Fly leveling and leveling with inverted staff reading
4. Site visit for various building components.

Section-II

ICA shall be based on minimum 3 experiments out of below list

1. Hands on- Domestic refrigerator and split air conditioner
2. Hands on- Pumps
3. Hands on – Compressors and Turbine Models
4. Demonstration of Power Plant equipment.

• **Text Books:**

1. Elements of Civil Engineering, S. S. Bhavikatti, New Age International Publishers.
2. Building Construction and Drawing, Bindra and Arora, Dhanpat Rai Publications
3. Essentials of Civil Engineering, Rangwala, S. C., Charotar Publishing House
4. Building Construction, Volumes 1 to 4, Mckay, W.B. and Mckay, J. K., Pearson India
5. Basic Civil Engineering, L. G. Gole, Mahalaxmi Publications
6. Elements of Civil Engineering, Kandya A A, Charotar Publishing house
7. Basics of Remote Sensing & GIS, S. Kumar, University Sc. Press
8. Thermal Engineering, P.L. Ballaney, Khanna Publishers
9. Thermal Engineering, Domkundwar, Kothandaraman,
Domkundwar,Dhanpat Rai & Co.
10. Elements of Workshop Technology, Vol-I & II, S.K. Hajra
Choudhury , A K,HajraChoudhury, Nirjhar Roy , Media Promoters
& Publishers Pvt. Ltd.
11. Design of Machine Elements, V.B. Bhandari, Tata McGraw Hill Publications.



P. A. H. Solapur University, Solapur
First Year B. Tech. (All Branches) Semester-I & II
(A. Y. 2023-24)

ESC-02 Basic Electrical and Electronics Engineering

Teaching Scheme

Theory– 3 Hrs. /Week, 3 Credits

Practical –2 Hr. /Week, 1 Credit

Examination Scheme

Theory –ESE-70Marks

ISE –30Marks

ICA–25Marks

Course Objectives:

ESC-02.O1	To introduce to students various simplification methods for dc circuits so that student can analyze dc circuits and can solve numerical problems based on it
ESC-02.O2	To introduce to students the fundamentals of electromagnetism and its application.
ESC-02.O3	To make students comprehend the generation and behavior of ac circuits for various loads.
ESC-02.O4	To emphasize on working and applications of diode.
ESC-02.O5	To make students comprehend the working of bipolar junction transistors with basic configurations.
ESC-02.O6	To introduce to students the fundamental of digital electronics.

Course Outcomes:

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

ESC-02.1	Apply the various simplification methods to analyze dc circuits.
ESC-02.2	Use the concept of electromagnetism to calculate the parameters of magnetic circuits and single-phase transformers.
ESC-02.3	Apply knowledge of ac fundamentals to analyze ac circuits.
ESC-02.4	Demonstrate the working, characteristics, and applications of diode.
ESC-02.5	Explain the working, characteristics, and applications of BJT
ESC-02.6	Perform arithmetic operations on a digital number system.

Section – I

Unit No. 01: DC Circuits		Hours: 06		Marks: 14	
<i>Sr. No.</i>	<i>Subunit</i>	<i>Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
1.1	Ohm's law, Kirchoff's Voltage, and Current law & its applications for circuit solutions	06	03	Explanation, simplification of circuits (numerical), applications	Remembering, understanding, applying
1.2	Simplifications of circuits using series, parallel combinations, Star- delta, delta-star conversions	08	03	Explanation, simplification of circuits (numerical), applications	Remembering, understanding, applying

Unit No. 02: Electromagnetism		Hours: 07		Marks:18	
<i>Sr. No.</i>	<i>Subunit</i>	<i>Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
2.1	Basic definitions related to magnetic circuits (flux, mmf, reluctance, flux density, magnetic field strength, permeability)	02	01	Explanation, Understandings	Understanding,
2.2	Series magnetic circuits with an air gap, magnetic leakage, and fringing	06	02	Explanation, Understanding, Numerical	Remembering, Understanding
2.3	Faraday's law of electromagnetic induction, Lenz's law, the concept of self and mutual inductance	04	02	Explanation, Understandings	Remembering, understanding
2.4	Working principle and construction of Single-Phase transformer and DC motor, EMF- equation of Single phase Transformer	06	02	Explanation, Understanding, Derivation, Numerical	Remembering, Understanding, applying

Unit No. 03: AC Circuits		Hours: 07		Marks: 18	
<i>Sr. No.</i>	<i>Subunit</i>	<i>Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
3.1	Generation of voltage and current, RMS value, average value, form factor, crest factor, and peak factor.	04	02	Explanation, understanding, applications, numerical	Remembering, understanding, applying
3.2	AC through pure resistance, pure inductance, and pure capacitance, Phasor diagram	06	03	Explanation, simplification of circuits (numerical), applications	Remembering, Understanding, applying
3.3	Series AC circuit (RL, RC, and RLC): impedance	08	02	Explanation, Derivation, numerical,	Remembering, Understanding, applying

Section II

Unit No. 04: Semiconductor Diodes		Hours: 08		Marks:18	
<i>Sr. No.</i>	<i>Subunit</i>	<i>Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
4.1	Semiconductors and p-n junction diode -Doping, depletion layer, barrier potential, construction, working, biasing, V-I characteristics, ratings.	08	04	Explain, define	Recalling, understanding
4.2	Diode applications - Circuit diagram & working of half wave rectifier, full wave rectifier, bridge rectifier, Capacitor filter using full wave rectifier- circuit diagram, working and formula of ripple factor.	10	04	Explain, define, and apply	Recalling, understanding, applying
Unit No 05: Bipolar Junction Transistor		Hours: 04		Marks: 14	
<i>Sr. No.</i>	<i>Subunit</i>	<i>Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
5.1	Bipolar Junction Transistor- construction, biasing, configuration with I/O characteristics for -CB, CE, CC, comparison between CB, CE, CC configurations, ratings of transistor	08	02	Explain, define, and numerical	Recall, understanding
5.2	Application of transistor- BJT as switch and amplifier	06	02	Explain, apply	Recall, understanding, applying

Unit No 06: Introduction to Digital Electronics		Hours: 08		Marks: 18	
<i>Sr. No.</i>	<i>Subunit</i>	<i>Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
6.1	Number system- decimal, binary, octal, hexadecimal & their inter-conversion, BCD code	05	02	Numerical	Recalling, understanding, applying
6.2	Binary Arithmetic- addition, subtraction, subtraction using 2's complement	04	02	Numerical	Recalling, understanding, applying
6.3	Logic Gates- AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR Gates - symbol, output equation, truth table, realization of basic gates using universal gates	05	02	Explain, define, and numerical	Recalling, understanding, applying
6.4	Boolean Algebra- laws & rules, De- Morgan theorem	04	02	Explain, define, and simplify	Recalling understanding, applying

- **In Semester Evaluation (ISE):**
- ISE shall be based upon student's performance in three tests conducted & evaluated at institute level

□ **Internal Continuous Assessment (ICA):**

ICA shall be based on:

Basic Electrical Engineering: (Minimum 4 experiments from the following)

1. Verification of Ohm's law
2. Verification of Kirchhoff's Voltage Law
3. Verification of Kirchhoff's Current Law
4. Verification of transformation ratio of single phase transformer.
5. Verification of voltage relation of RL, RC, and RLC series-connected AC circuits

Basic Electronics Engineering :(Minimum 4 experiments from the following)

1. Identification, testing, and measurement of electronic components -resistors, capacitors, inductors.
2. V-I characteristics of PN junction diode.
3. Half and full wave rectifier.
4. Controlling relay using a transistor as a switch.
5. Verification of truth table of basic gates and universal gates using ICs.

□ **Text-Books:**

1. Electrical Technology (Volume I & 2), B L Theraja, 22nd edition, S Chand & Company Ltd
2. Basic Electrical Engineering, V K Mehta, Revised edition, S Chand & Company Ltd.
3. Basic Electronics Solid State, B L Thereja, Revised edition, S Chand & Company Ltd.
4. Digital Principles and Applications, Albert Malvino, Donald Leach, Tata McGraw Hills Publication
5. Principles of Electronic Devices and Circuits (analog and digital), B. L. Theraja, R. S. Sedha, S. Chand publication

□ **Reference-Books:**

1. Basic Electrical Engineering, Dr. Debashisha Jena, Revised Edition, Wiley Engineering Press
2. Electrical Engineering Fundamentals, V Del Toro, 2ndedition, Prentice-Hall
3. Electrical Technology, E Hughes, 10th edition, ELBS, Longman
4. Laboratory courses in Electrical Engineering, S G Tarnekar, P K Kharbanda, S B Bodhe and S D Naik, S Chand & Company Ltd
5. Basic Electronics Engineering, V. Baru, R. Kaduskar, S.Gaikwad, Dreamtech Publication
6. Electronic Devices and Circuits, David A. Bell, Oxford University, Press India, Fifth edition
7. Electronic Devices, Floyd, Pearson Education publication
8. Electronic Device & Circuits, Millman Halkias, Tata McGraw Hill, Third edition
9. Electronic Components and Materials, M. A. Joshi (Wheeler publication)



P. A. H. Solapur University, Solapur
First Year B. Tech (All Branches) Semester-I
ESC-03 ENGINEERING MECHANICS

Teaching Scheme
 Theory: 3Hrs. /Week, 3 Credits
 Practical: 2 Hrs./Week, 1 Credit

Examination Scheme
 ESE- 70Marks
 ISE 30Marks
 ICA-25Marks

Course Objectives:

ESC-03.O1	To impart knowledge of basic phenomena in Engineering Mechanics and to lay a Foundation for its Engineering applications by studying Statics.
ESC-03.O2	To develop scientific approach amongst the students towards analysis of trusses and prepare the student for higher level courses.
ESC-03.O3	To impart knowledge of Kinematics for analyzing linear and curvilinear motion of object.
ESC-03.O4	To impart knowledge of Kinetics for analyzing linear and curvilinear motion of object with application of D'Alembert's Principle.
ESC-03.O5	To develop scientific approach amongst the students towards use of Work Energy methods for analyzing linear and rotational motion
ESC-03.O5	To develop scientific approach amongst the students to locate centroid of area and find second moment of area.

Course Outcomes:

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

ESC-03.1	Apply fundamentals of Engineering Mechanics for analyzing effects of a system of forces acting on a rigid body.
ESC-03.2	Analyze various types of statically determinate pin jointed trusses.
ESC-03.3	Apply knowledge of Kinematics of rigid body motion to solve problems of bodies in motion.
ESC-03.4	Apply knowledge of Kinetics of rigid body motion to solve problems of bodies in motion.
ESC-03.5	Apply Work Energy methods and conservation of momentum principle for analyzing linear and rotational motion.
ESC-03.6	Locate centroid and center of Gravity and calculate moment of Inertia of plane lamina.

Course Curriculum: Section - I

Unit No. 01: Resultant of coplanar forces and Equilibrium of Rigid Bodies Hours : 12 Marks: 22					
Sr. No.	Subunit	Marks	Hours	Assessment	Bloom's level
1.1	Mechanics, particle, rigid body, scalar quantities, vector quantities, force, law of transmissibility of force, moment of a force, couple, moment of a couple, resultant, Varignon's theorem.	06	3	Definition, explanation, derivations, numerical examples	Remembering, understanding, applying.
1.2	Equilibrium of co-planar forces, analytical conditions of equilibrium, free body diagrams, Lami's theorem.	08	5	Definition, explanation, derivations, numerical examples	Remembering, understanding, applying
1.3	Friction: types, limiting friction, laws of friction, friction on inclined planes. Type of beams and supports, Support reactions of statically determinate beams with point loads, inclined loads, uniformly distributed load, uniformly varying loads and couples.	08	5	Definition, explanation, derivations, numerical examples	Remembering, understanding, applying

Unit No. 02: Analysis of Pin-Jointed Plane Trusses Hours:06 Marks:14					
Sr. No.	Subunit	Marks	Hours	Assessment	Bloom's level
2.1	Pin-jointed statically determinate plane trusses, types, assumptions, types of a member, zero force members.	06	2	Definition, explanation, derivations, numerical examples	Remembering, understanding, applying
2.2	Analysis of trusses by method of joints and method of sections.	08	4	Definition, explanation, derivations, numerical examples	Remembering, understanding, applying, analyzing

Unit No. 03: Kinematics of particles Hours : 08 Marks: 13					
Sr. No.	Subunit	Marks	Hours	Assessment	Bloom's level
3.1	Rectilinear motion, equations of motion, relative velocity (simple problems)	05	3	Definition, explanation, derivations	Remembering, understanding, applying
3.2	Projectile motion (horizontal projection, projection on level ground), angular motion, relation between angular motion and linear motion, equation of angular motion.	08	5	Definition, explanation, derivations, numerical examples	Remembering, understanding, applying

Section – II

Unit No. 04: Kinetics of Particles Hours : 06 Marks: 17					
Sr. No.	Subunit	Marks	Hours	Assessment	Bloom's level
4.1	Newton's laws of motion for linear and angular motion, D'Alembert's principle, rectilinear motion on a rough inclined plane, motion of connected bodies.	09	5	Definition, explanation, derivations	Remembering, understanding, applying
4.2	Circular motion, kinetics of rotation-torque, mass moment of inertia, problems on centroidal rotation and linear motion, equation of angular motion.	08	3	Definition, explanation, derivations, numerical examples	Remembering, understanding, applying, analyzing

Unit No. 05: Work Energy Methods Hours : 07 Marks: 16					
Sr. No.	Subunit	Marks	Hours	Assessment	Bloom's level
5.1	Potential energy, kinetic energy of linear motion, principle of conservation of energy, work energy equation and its applications	08	4	Definition, explanation, derivations	Remembering, understanding, applying
5.2	Impulse momentum method, Conservation of momentum and their applications.	08	3	Definition, explanation, derivations, numerical examples	Remembering, understanding, applying

Unit No. 06: Center of Gravity and Moment of Inertia Hours :07 Marks: 16					
Sr. No.	Subunit	Marks	Hours	Assessment	Bloom's level
6.1	Centre of gravity, centroid of a simple and composite area.	06	2	Definition, explanation, derivations	Remembering, understanding, applying
6.2	Moment of inertia- Definition, moment of inertia of plane, perpendicular axis theorem, parallel axis theorem, moment of inertia of symmetrical and unsymmetrical sections, radius of gyration, polar moment of inertia.	10	5	Definition, explanation, derivations, numerical examples	Remembering, understanding, applying

- **In Semester Evaluation (ISE):**

ISE shall be based upon student's performance in three tests conducted & evaluated at institute level

- **Internal Continuous Assessment (ICA):**

ICA shall be based on the following experiments and assignments

Experiments: any six of below

1. Law of parallelogram of forces
2. Triangle Law of forces using Jib crane apparatus
3. Law of polygon of forces
4. Law of Moments using Bell crank lever
5. Support reaction of beams
6. Newton's Second law using Fletcher's trolley
7. Centrifugal force apparatus
8. Application of spreadsheet for solving simple numerical of law of moments, Beam reaction, kinematics, etc.

*** Text Books:**

1. Engineering Mechanics, Bhavikatti S. S., New Age International Pvt. Ltd.
2. Engineering Mechanics, K. L. Kumar, Tata McGraw Hill Publications
3. Engineering Mechanics, Basudeb Bhattacharyya, Oxford University Press.
4. Engineering Mechanics - Statics and Dynamics, A. Nelson, McGraw Hill Education (India) Pvt. Ltd.
5. Engineering Mechanics Statics and Dynamics, A.K. Dhiman, P. Dhiman & D.C. Kelshreshtha, McGraw Hill Education (India) Pvt. Ltd
6. A Text book of Engineering Mechanics, R.S. Khurmi, S. Chand Publications
7. Engineering Mechanics by Sadhu Singh (Khanna Publishers)

- **Reference Books:**

1. Vector Mechanics for Engineers: Statics and Dynamics by Beer and Johnson, Tata McGraw Hill Education (India) Pvt. Ltd.
2. Engineering Mechanics by Irving H. Shames, Prentice Hall of India, New Delhi.
3. Engineering Mechanics Statics and Dynamics by Ferdinand Singer, Harper & Row Publications.
4. Engineering Mechanics Statics, Vol.1, SI Version, 7th Edition – J. L. Meriam, L. G. Kraige, Wiley India Pvt. Ltd., New Delhi.
5. Engineering Mechanics Dynamics, SI Version, 7th Edition – J. L. Meriam, L. G. Kraige, Wiley India Pvt. Ltd., and New Delhi.



P. A. H. Solapur University, Solapur
First Year B. Tech. (All Branches) Semester-I

Ability Enhancement Course (AEC-01)

COMMUNICATION SKILLS

Teaching Scheme

Theory– 1 Hr. /Week, 1Credit

Practical– 2 Hrs. /Week, 1Credit

Examination Scheme

ISE – 25 Marks

ICA– 25 Marks

• **Course Objectives:**

AEC-01.O1	To make students understand English grammar and its application in communication
AEC-01.O2	To prepare students for competitive exams with focus on verbal ability
AEC-01.O3	To develop students' oral communication skills
AEC-01.O4	To enhance reading and comprehension skills of the students
AEC-01.O5	To prepare students for professional written communication
AEC-01.O6	To develop and enhance communication skills of students

• **Course Outcomes:**

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

AEC-01.1	Understand English grammar and apply it in communication.
AEC-01.2	Prepare for competitive exams with focus on verbal ability.
AEC-01.3	Develop oral communication skills.
AEC-01.4	Enhance reading and comprehension skills.
AEC-01.5	Prepare for professional written communication.
AEC-01.6	Develop and enhance communication skills.

- **Course Curriculum**

Unit No. 01: English Grammar		Hours: 06		
<i>Sr. No.</i>	<i>Subunit</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
1.1	Parts of Speech	01	Sentence formation, corrections/ error finding	Remembering, Understanding, Applying
1.2	Tenses	02	Sentence formation, corrections / error finding	Remembering, Understanding, Applying
1.3	Types of Sentences	01	Sentence formation & Conversion	Remembering, Understanding, Applying
1.4	Change the Voice	01	Sentence formation & Conversion	Remembering, Understanding, Applying
1.5	Articles	01	Sentence formation, corrections / error finding	Remembering, Understanding, Applying
Unit No. 02: Vocabulary Building		Hours: 02		
<i>Sr. No.</i>	<i>Subunit</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
2.1	Synonyms & Antonyms	01	Finding Synonym / Antonym of the given word	Remembering, Understanding, Applying
2.2	Idioms & Phrases	01	Identifying Meaning of the idioms and phrases	Remembering, Understanding, Applying
Unit No. 03: Oral Communication		Hours: 02		
<i>Sr. No.</i>	<i>Subunit</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
3.1	Situational Conversation	01	Role play based on formal or informal conversation, writing conversation based on a situation	Remembering, Understanding, Applying
3.2	Describing Objects, Narration of Events	01	Description of Objects and Narration of Events	Remembering, Understanding, Applying
Unit No. 04: Reading Comprehension		Hours: 02		
<i>Sr. No.</i>	<i>Subunit</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
4.0	Reading Comprehension	02	Questions based on Comprehension passage	Remembering, Understanding, Applying
Unit No. 05: Writing Practices		Hours: 03		
<i>Sr. No.</i>	<i>Subunit</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
5.1	Business Correspondence: Enquiry Letter, Order Letter, Complaint Letter, Adjustment Letter	01	Writing a professional / business letter	Remembering, Understanding, Applying
5.2	Office Drafting: Notice, Agenda & E-mail	01	Drafting Professional Notices, Agenda & e-mails	Remembering, Understanding, Applying
5.3	Job Application with Resume	01	Writing Job Application with Resume for various posts	Remembering, Understanding, Applying

In Semester Evaluation (ISE)–

ISE shall be based upon student's performance in three tests conducted & evaluated at institute level

- **Internal Continuous Assessment (ICA)-**

ICA shall be based on the performance of the student during the practical sessions covering a minimum of 12 exercises out of below-

1. Grammar Exercise –I based on Parts of Speech
2. Grammar Exercise –II based on Tenses
3. Grammar Exercise –III based on Types of Sentences
4. Grammar Exercise –IV based on Change the Voice
5. Grammar Exercise –IV based on articles
6. Vocabulary – Based on the synonym and antonym of the given word
7. Exercise on Idioms and Phrases
8. Writing conversation based on formal situation
9. Writing conversation based on informal situation
10. Description of Objects/Narration of Events on a given topic/situation
11. Exercise based on reading comprehension
12. Business Letter Writing
13. Professional Notice, Agenda and E mail writing
14. Writing Job Application with Resume

Text Books:

1. English Grammar Just for You. Rajeevan Karal. Oxford University Press
2. Technical English. Dr. M. Hemamalini. Wiley India Pvt.
3. English for Practical Purposes, Z. N. Patil, B.S. Valke, A.R. Thorat, Zeenath Merchant
4. Study Writing. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press.2006.
5. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press.
6. Communication Skills, Sanjay Kumar and Pushpa Lata. Oxford University Press.2011

References Books:

1. English Grammar & Composition, Wrenn & Martin, S. Chand
2. Practical English Usage. Michael Swan. OUP.1995.
3. Remedial English Grammar. F.T Wood. Macmillan.2007.
4. On Writing Well. William Zinsser. Harper Resource Book.2001.
5. Business Communication, Shalini Kalia, Shailja Agarwal, Wiley
6. Communication Skills for Technical Students, T. M. Farhathullah, Orient Black Swan
7. Longman Dictionary of Contemporary English
8. Essential Activator, Longman
9. Word Power Made Easy, Norman Lewis



P. A. H. Solapur University, Solapur
First Year B. Tech (All Branches) Semester-I

CC-01 SPORTS & YOGA / NCC / NSS/UBA
(Liberal Learning Course-I)

Teaching Scheme

Theory – 1Hrs. /Week,1Credits

Laboratory – 2 Hrs./Week,1Credit

Examination Scheme

ICA-25Marks

• **Course Objectives:**

CC-01.01	To introduce the learners to the concept of Physical Education and Sports its relevance in daily life.
CC-01.02	To familiarize the learners with health -related Exercises, Sports and Yoga for overall growth & development.
CC-01.03	To create a foundation for the professionals in Physical Education and Sports.
CC-01.04	To Create Awareness about NSS/NCC for the Social Cause.
CC-01.05	To create the interest of students in liberal arts.

• **Course Outcomes:**

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

CC-01.1	Understand the basic principles and practices of Physical Education & Sports.
CC-01.2	Understand and apply the concepts of Physical Education, Sports and Yoga with its various implications.
CC-01.3	Develop professionalism among students to conduct, organize & officiate, Physical Education and Sports events at schools, colleges and community.
CC-01.4	Understand and apply the knowledge of NSS/NCC in the social fabric system.
CC-01.5	Become free thinker, open communicator, knowledgeable citizens and respectable individuals.

- **Course Curriculum**

Unit No.01: Introduction to Physical Education and Sports. Hours: 06				
<i>Sr. No.</i>	<i>Subunit</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
1.1	Meaning, Definition and Importance of Physical Education & Sports	01	Specific Warm-Up and Cool Down	Remembering, Understanding, Applying
1.2	Aims and Objective of Physical Education & Sports	02	Fundamental Techniques, Skills, Drills, Tactics, of the specific Game (Hockey, Kho -Kho , Kabaddi, etc.)	Remembering, Understanding, Applying
1.3	Career Opportunities in Physical Education and Sports	01	Specific Fitness for specific Sport/Game track events, field events.	Remembering, Understanding, Applying
1.4	Brief Introduction of One Major Game and One Indigenous ,Modern trends of Physical Education and Sports	01	Officiating of the Specific Game, Intramural and Extramural Competitions, weight training, circuit training, calisthenics	Remembering, Understanding, Applying
Unit No.02: Yoga Hours: 02				
<i>Sr. No.</i>	<i>Subunit</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom'sLevel</i>
2.1	Principles of Yogic practitioner's	01	Standing, Sitting, Supine, Prone and Balancing Asanas.	Remembering, Understanding, Applying
2.2	Ashtanga Yoga, Shitalikarna Vyayama, Suryanamaskara	01	Techniques of Pranayama ,Basic set of Meditation	Remembering, Understanding, Applying
Unit No.03: National Service Scheme (NSS) Hours: 02				
<i>Sr. No.</i>	<i>Subunit</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom'sLevel</i>
3.1	Importance and role of youth leadership and Youth development programmes	01	Meaning, types and traits of leadership, qualities of good leaders; importance and roles of youth leadership	Remembering, Understanding, Applying
3.2	Life competencies	01	Definition and importance of life competencies, problem-solving and decision-making, inter personal communication	Remembering, Understanding, Applying
3.3	Health, hygiene and sanitation		Definition needs and scope of health education; role of food, nutrition, safe drinking water, water born diseases and sanitation (Swachh Bharat Abhiyan) for health; national health programmes and reproductive health	Remembering, Understanding, Applying

Unit No.04: National Cadet Corps (NCC)		Hours: 03		
<i>Sr.No.</i>	<i>Subunit</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom'sLevel</i>
4.1	Basic Information about National Cadet Corps	01	Arms Drill- Attention, stand at ease, stand easy. Getting on parade. Dismissing and falling out. Ground/take up arms, examine arms.	Remembering, Understanding, Applying
Unit No.05: Liberal And Arts		Hours: 02		
<i>Sr.No.</i>	<i>Subunit</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom'sLevel</i>
5.1	Literary and Cultural Studies, Media Studies , Historical Studies and Material Culture, Psychology, International Relations and Political Science ,Economics	02	The students will also be required to take in participation in the creative expressions-based courses (Music/Theatre/Dance).	Remembering, Understanding, Applying

Note:

- 1) Uniform: Students are encouraged to wear uniform during practical sessions: Preferably White Tee Shirt, Track Pants, Shoes and Socks.
- 2) The games mentioned in the practical may be changed depending on the season and facilities.

Internal Continuous Assessment (ICA) –

ICA Shall be based on the performance of student during the practical sessions and covering performance on the field.



P. A. H. Solapur University, Solapur
First Year B. Tech (All Branches) Semester-I/II

SEC-01 WORKSHOP PRACTICE

Teaching Scheme
Laboratory – 2 Hrs./Week, 1Credit

Examination Scheme
ICA-25Marks

• **Course Objective:**

SEC-01.O1	To make a student learn hardware and software of a computer.
SEC-01.O2	To make student assemble a desktop PC from its components and also using alternatives.
SEC-01.O3	To make the students acquainted with various skills and tools involved in electronics.
SEC-01.O4	To make students aware of various circuit building techniques, acquaint with the knowledge for tools and to have hands on for the same.
SEC-01.O5	To make the students acquainted with various skills involved in manufacturing and assembly.
SEC-01.O6	To make student aware of various cutting and joining processes and to have hands on for the same.

• **Course Outcomes:**

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

SEC-01.1	Identify various hardware and software components of a computer and compare between them.
SEC-01.2	Assemble a desktop from components supplied and Setup a working desktop system using a Raspberry Pi board.
SEC-01.3	Identify and use various electronic components and instruments and Develop basic electronic circuits on breadboards.
SEC-01.4	Demonstrate the use of an Arduino board using basic circuits.
SEC-01.5	Prepare different shaped metal work piece joints from the given metal blanks by selecting different tools and machines, Perform different types of welding of metal components.
SEC-01.6	Select different engineering tools required to perform, fitting, machining, welding and joining processes.

- **Course Curriculum:**

Unit No.	Unit Title	No. of Lab/ Task Sessions	Assessment	Bloom's Level
From Computer Science Engineering Domain				
01	1.Name and identify various PC hardware components: USB Mouse, PS/2 Mouse, Keyboard, LCD/LED Monitor, VGA, HDMI, CAT5, CAT6, server, routers, fiber cable, Hard disk, RAM, CMOS battery, SMPS, cache, ROM, BIOS 2.Type using all your fingers and achieve a speed of 30 words per minute	03	Demonstration, Hands-on experience, report writing	Perception (L1), Set (L2), Guided response(L3),
02	1.Introduction to various important software: Ubuntu, Windows, Mac, Libre office and Microsoft Office; Firefox, Google Chrome, Tor; Linux Command Line (few basic commands); Photoshop, Gimp Understand the broad structure and functioning of the Internet; Learn the following terms and concepts: LAN, DNS, Proxy, Router, Hub, Switch, Server, Client, Website, Web-server; Understand basic networking commands, applications and services: ssh, telnet, ftp, winscp, ping, http, https, various search services (google, start page, aggregator search services) 2.Prepare a working LAN cable by using crimping tools.	03	Explaining, and hands-on experience, report writing	Perception (L1), Set (L2), Guided response(L3)
03	1. Assemble a Desktop PC from it's Components: Install any two operating systems on a PC making it dual boot, including latest version of Ubuntu Linux, Windows 7/8 2. Connect 2-4 computers together using a network hub to create a LAN	04	Explaining, and hands-on experience, report writing	Perception (L1), Set (L2), Guided response(L3)
04	1.Setup a working desktop system using a Raspberry Pi board. Download the OS image from web. 2.Try installing one of the various operating systems on the board: Raspbian, Ubuntu Mate, Openelec, OSMC, Pidora, RISC OS, Arch Linux ARM, etc.	04	Explaining, and hands-on experience, report writing	Perception (L1), Set (L2), Methodology (L4)

From Electronics Engineering Domain				
05	<p>Introduction to Basic Electronic Components and Devices : Introduction to various electrical passive components such as Resistors, inductors and capacitors, introduction to active components, introduction to breadboard, Measurement of resistance using the colour code, series and parallel connection of the resistances and its implementation on breadboard.</p> <p>Timer IC: Application of IC-555 as an Astable mode Calculation of duty cycle and frequency of IC 555 in a stable mode.</p>	03	<p>Components introduction identification, Series-Parallel resistor identification and reduction, implementation, Timer calculations, report writing</p>	<p>Introduce (L1) Identify (L2) Calculate / Solve (L3)</p>
06	<p>Introduction to Electronics Instruments: Exposure to usual electronic equipment/instruments such as Soldering iron, Multimeter, Oscilloscope, Function generator, Power supply, Information about their front panels, Demonstrations on their working, Hands-on for measurement of component values and DC voltage using multimeter, measurement of amplitude, time period and frequency of the waveform Square wave/any small signal from function generator on Oscilloscope (DSO), Measurement of the voltage and current in the circuit implemented on breadboard using multimeter.</p>	03	<p>Ability to state and demonstrate the use of electronics tools and classify, report writing</p>	<p>State/ Demonstrate (L1) Classify (L2)</p>
07	<p>Introduction to Arduino: Arduino Configuration and architecture, Device and platform features, Concept of digital and analog ports, Familiarizing with Arduino Interfacing Board, Introduction to Embedded C and Arduino platform (IDE), Arduino data types (Variables and constants, Operators, Control Statements, Arrays, Function).</p>	04	<p>Demonstration of Arduino Platform with ability to discriminate analog and digital pins and its usage, report writing</p>	<p>Demonstrate (L1) Classify (L2)</p>
08	<p>Arduino I/O & Sensors : Arduino I/O Functions (Pins Configured as INPUT, Pull-up Resistors, Pins Configured as OUTPUT,FUNCTIONS: pinMode(), digitalWrite(), analogRead(),Arduino Interrupts), SENSORS: Humidity Sensor, Temperature Sensor, Water Detector / Sensor, PIR Sensor, Ultrasonic Sensor, Magnetic relay switches.</p>	04	<p>Configuring I/O pins, Interfacing simple sensors, report writing</p>	<p>Classify (L2) Interface (L3)</p>

From Mechanical and Civil Engineering Domain

09	Assembly: assembly of the following assemblies/sub-assembly-Three and Four jaw chuck.	01	Assembly job, team working, report writing	Perception (LI), Set (L2), Guided response(L3), Mechanism (L4)
10	Assembly: assembly of the following assemblies/sub-assembly- Lathe Tailstock	01	Assembly job, team working, report writing	Perception (LI), Set (L2), Guided response(L3), Mechanism (L4)
11	Assembly: assembly of the following assemblies/sub-assembly- Apron of Lathe	01	Assembly job, team working, report writing	Perception (LI), Set (L2), Guided response(L3), Mechanism (L4)
12	Assembly: assembly of the following assemblies/sub-assembly-Cross Slide assembly	01	Assembly job, team working, report writing	Perception (LI), Set (L2), Guided response(L3), Mechanism (L4)
13	Assembly: assembly of the following assemblies/sub-assembly-Tumbler Gear assembly for different types of threads	01	Assembly job, team working, report writing	Perception (LI), Set (L2), Guided response(L3), Mechanism (L4)
14	Welding: demonstration and hands on- arc welding, gas welding, resistance welding, gas cutting, spot welding.	03	Explaining, and hands-on experience, report writing	Perception (LI), Set (L2), Guided response (L3)
15	Fitting job : One job on fitting, to size, male-female fitting including, marking, cutting, shearing, chipping sizing of metals, drilling and tapping to know concept of inter changeability.	03	Fitting job, report writing	Perception (LI), Set (L2), Mechanism (L4)
16	Machine Tools: demonstration and hands on- Lathe Machine, Drilling Machine, Milling Machine	03	Explaining, and hands-on experience, report writing	Perception (LI), Set (L2), Guided response(L3)

- **Internal Continuous Assessment (ICA):**

ICA shall be based on completion of any of the eight LAB Sessions/Tasks on the above-mentioned units along with laboratory journal.

- **Text Books:**

1. Building Your Own Computer Made Easy: The Step By Step Guide (Computers Made Easy) by James Bernstein.
2. Raspberry Pi Cookbook: Software and Hardware Problems and Solutions 3rd Edition by Simon Monk .
3. A text book of Computer Hardware and Networking (DJ 5) [Print Replica] Kindle Edition by Ms. JyotikaDeshmukh .
4. Principles of Electronics by V.K Mehta (Author), Rohit Mehta (Author).
5. Basic Electronics: Devices, Circuits and it Fundamentals by Kal.
6. The Basic Soldering Guide Handbook: Learn to solder electronics successfully by Alan R Winstanley.
7. Engineering Practices, M Karthik.
8. Workshop Technology, Raghuvanshi.
9. Workshop Technology, HajraChowdhary, Media Promoters & Publishers Pvt. Ltd.



P. A. H. Solapur University, Solapur
First Year B. Tech. (All Branches) Semester-II
BS-04 ENGINEERING MATHEMATICS -II

Teaching Scheme

Theory – 3 Hrs. /Week, 3Credits

Practical– 2 Hrs. /Week, 1Credit

Examination Scheme

Theory – ESE -70Marks

ISE - 30Marks

ICA–25Marks

• **Course Objectives:**

BS-04.O1	To introduce to student some methods to find the solution of first order & first degree ordinary differential equations with its applications
BS-04.O2	To introduce to student awareness of concept of convergence of sequences and series
BS-04.O3	To introduce the tools of differentiation of functions of complex variable that are used in various techniques dealing engineering problems
BS-04.O4	To make familiar to tracing of Cartesian, polar and parametric curves
BS-04.O5	To acquaint the student with mathematical tools needed in evaluating improper integrals, multiple integrals and their usage

• **Course Outcomes:**

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

BS-04.1	Find the solution of first order & first degree ordinary differential equations with its applications
BS-04.2	Determine the convergence of sequences and infinite series.
BS-04.3	Determine the differentiation of functions of complex variable that are used in various techniques dealing engineering problems.
BS-04.4	Solve improper integrals using mathematical tools.
BS-04.5	Sketch cartesian, polar and parametric curves.
BS-04.6	Solve multiple integrals and use them to find area of curve and mass of lamina.

• **Course Curriculum**

Section I

Unit No. 01: ODE of First order and Degree and Application		Hours : 09			Marks: 22
<i>Sr.No.</i>	<i>Subunit</i>	<i>Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
1.1	Order, degree and general solution of differential equations, non-homogeneous differential Equations.	03	01	Solution of differential equations.	Remembering, understanding,
1.2	Exact differential equations, non- exact reducible to exact, linear differential equations, non linear reducible to linear.	10	04	Solution of differential equations.	Understanding, applying
1.3	Applications to orthogonal trajectories, electrical and mechanical engineering (Newton's law of cooling only)	09	04	Application of ordinary differential equations.	Remembering, understanding, applying
Unit No. 02: Infinite Series		Hours : 06			Marks: 13
<i>Sr. No.</i>	<i>Subunit</i>	<i>Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
2.1	Infinite sequences, infiniteseries, types of series	01	01	Examine	Remembering, understanding,
2.2	Test of convergence: Cauchy test, comparison test and De Alembert's test	07	03	Numerical, apply standard results	Remembering, understanding, applying
2.3	Absolute and conditional convergence,	05	02	Apply standard results	Remembering, applying
Unit No. 03: Complex Variable (Differentiation)		Hours : 08			Marks: 17
<i>Sr. No.</i>	<i>Subunit</i>	<i>Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
3.1	Statement of De-Moivre's Theorem (without proof), Application of De-Moivre's theorem – roots of algebraic equations,	04	02	Numerical example, evaluate, applications	Remembering, understanding Applying
3.2	Circular and Hyperbolic functions	01	01	Definition,	Remembering, applying

3.3	Differentiation, Cauchy Riemann Equations (Without Proof), Analytic Functions, Elementary Analytic Functions (Exponential, Trigonometric and Logarithmic function)	06	02	Simplification, applications	Remembering, applying
3.4	Harmonic Functions and Conjugates, Construction of Analytic Function	06	03	Definition, Evaluate, applications	Remembering, applying

Section II

Unit No. 04: Integral Calculus		Hours : 07		Marks: 16	
<i>Sr. No.</i>	<i>Subunit</i>	<i>Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
4.1	Gamma function and properties,	04	02	Evaluate/numerical,	Remembering, understanding, applying
4.2	Beta function and properties, duplication formula with proof.	09	03	Evaluate/numerical,	Remembering, understanding, applying
4.3	Differentiation under integral sign with constant limit	03	02	Evaluate/numerical,	Remembering, understanding, applying
Unit No. 05: Curve Tracing		Hours : 06		Marks: 13	
<i>Sr. No.</i>	<i>Subunit</i>	<i>Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
5.1	Tracing of Cartesian curves-	05	02	Trace of curve	Understanding, applying
5.2	Tracing of polar curves- Rose curve and Cardioid only	04	02	Trace of curve	Understanding, applying
5.3	Tracing of parametric curves	04	02	Trace of curve	Remembering, understanding, applying

Unit No. 06: Multivariable Integral Calculus		Hours :09		Marks: 23	
<i>Sr. No.</i>	<i>Subunit</i>	<i>Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
6.1	Direct evaluation of Double integral, Evaluation over the given region,	05	02	Evaluate/numerical,	Understanding, applying
6.2	Change of order of integration, change to polar, triple integration	09	04	Evaluate/numerical,	Understanding, applying
6.3	Application of double integral to find area and mass of lamina.	09	03	Application/numerical	Remembering, understanding, applying

- **In Semester Evaluation (ISE):**

In Semester Evaluation (ISE) marks shall be based upon student's performance in three tests conducted & evaluated at institute level.

- **Internal Continuous Assessment (ICA):**

ICA shall be based on student's performance during the laboratory sessions, minimum 6 assignments and on completion of minimum 8 exercises out of the following exercises:

1. Solve any 5 examples on non-homogenous differential equations.
2. Solve any 5 examples on reducible exact and reducible to linear differential equations.
3. Solve any 5 examples on orthogonal trajectories.
4. Solve any 5 examples on electrical engineering applications.
5. Solve any 5 examples on comparison test, ratio test and Cauchy nth root test of convergence
6. Solve any 5 examples on absolute and conditional convergence.
7. Solve any 5 examples on roots of algebraic equations using De-Moivre's Theorem.
8. Solve any 5 examples on finding real and imaginary parts using Milne-Thompson method.
9. Solve any 5 examples on verify harmonic functions and hence find its harmonic conjugates.
10. Solve any 5 examples on beta and gamma functions.
11. Solve any 5 examples by DUIS rule.
12. Solve any 5 examples on tracing of Cartesian Curves.
13. Solve any 5 examples on tracing of polar and parametric Curves.
14. Solve any 5 examples on change the order of integration.
15. Solve any 5 examples on area by using double integral.
16. Solve any 5 examples on mass of lamina by using double integral.

✓ *Note – Students shall be encouraged to use Scilab, R-programming and other software's for solving examples*

- **Text Books:**

1. A Text Book of Applied Mathematics, P.N. and J.N. Wartikar, Vol.1, Pune Vidyarthi GrihaPrakashan.
2. Advanced Engineering Mathematics, H. K. Dass, S. Chand Publications, Delhi.
3. Engineering Mathematics (Volume I), ITL Education, Cengage Learning.
4. Engineering Mathematics, Ravish R Sing and Mukul Bhatt, McGraw Hill.
5. Applied Mathematics-I,II, Kreyzig's, Wiley.
6. A text book of Engineering Mathematics, N.P. Bali and Manish Goyal, Laxmi Publications, 2008.

- **Reference Books:**

1. Higher Engineering Mathematics (42nd Edition), B.S. Grewal Khanna Publications, Delhi.
2. Engineering Mathematics, Srimanta Pal and Subodh C. Bhunia, Oxford Higher Education.
3. Mathematics for Engineering Applications, Kuldeep S. Rattan and Naathan W. Klingbeil Wiley. (Modeling and Core Engineering Application)
4. Higher Engineering Mathematics, Ramana B. V., Tata McGraw Hill New Delhi, 2010.



**P. A. H. Solapur University, Solapur First Year B.
Tech. (All Branches) Semester-II
ESC-04 ENGINEERING GRAPHICS AND CAD**

Teaching Scheme

Laboratory—4 Hrs. /Week, 2 Credit

Examination Scheme

ISE – 25 Marks

ICA – 50 Marks

• **Course Objectives:**

- To prepare the students for the effective technical communication
- To provide them exposure of techniques, skills, and modern engineering tools necessary for engineering practice
- To prepare the students to design a system, component, or process to meet desired needs within realistic constraints around them in professional life

• **Course Outcomes:**

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

- ESC-04.1 Draw the projections of oblique lines and planes
- ESC-04.2 Explain views of solids and their sectional surfaces.
- ESC-04.3 Visualize and draw the orthogonal views.
- ESC-04.4 Draft the machine components and related parts by using commercial drafting software.

Section-I

UNIT NO 01: Introduction to Engineering Drawing and Projection of Lines & Planes				MARKS: 20
Sr. No.	Subunit	Marks	Hours	Bloom's Level
1.1	Principles of Engineering Graphics and their significance. Dimensioning, Lettering. Scales: Plain, Diagonal and Engineering Scales. Introduction to principal planes of projections, Projections of the points located in same quadrant and different quadrants, Projections of line with its inclination to one reference plane and with two reference planes. True length and inclination with the reference planes.	10	06	Remembering(L1) Understanding(L2), Applying(L3)
1.2	Projection of polygonal surface and circular lamina located in first quadrant inclined to one or both reference planes	10	06	Remembering(L1) Understanding(L2), Applying(L3)
Unit No.02 Projection of Solids & Section of Solids				MARKS: 20
2.1	Classification of solids, projections of solids (cylinder, cone, pyramid and prism) Solid inclination to one reference plane.	10	06	Remembering(L1) Understanding(L2), Applying(L3)
2.2	Sections of Solids: Right regular solids and Auxiliary views for the true shape of the sections such as Prism, Cylinder, Pyramid, and Cone.	10	06	Remembering(L1) Understanding(L2), Applying(L3)

Section-II

UNIT NO 03: Orthographic Projections				MARKS: 18
3.1	Fundamental of projection along with classification, type of lines used in drawing, conventions used in sectional drawings Projections from the pictorial view of the object on the principal planes for view from front, top and sides using first angle projection method, full sectional view.	18	08	Remembering(L1) Understanding(L2), Applying(L3)
Unit No. 04 Computer Aided Drawing				MARKS: 10
5.1	Introduction to AutoCAD, Basic commands for 2D drawing like: Line, Circle, Polyline, Rectangle, Hatch, Fillet, Chamfer, Trim, Extend, Offset, Dim style, etc.	10	08	Remembering(L1) Understanding(L2), Applying(L3)

- **In Semester Evaluation (ISE):**
- In Semester Evaluation (ISE) marks shall be based upon student's performance in three tests conducted & evaluated at institute level.
- **Internal Continuous Assessment (ICA):**
ICA shall be based on below drawing assignments

Sr. No.	Name of Sheet	No. of sheet
1	Projection of Lines & Planes	01
2	Projection of Solids & Section of Solids	01
3	Orthographic Projection	01
4	Computer aided Drawing	02

Suggested Text/ Reference Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Engineering Drawing, Charotar Publishing House.
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. Agrawal B. & Agrawal C.M. (2012), Engineering Graphics, TMH Publication
4. Engineering Graphics & Design, A.P. Gautam & Pradeep Jain, Khanna Publishing House
5. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.
6. Suitable CAD Software Theory and User Manuals.



P. A. H. Solapur University, Solapur
First Year B. Tech (All Branches) Semester-I/II

SEC-02 DATA ANALYSIS AND PROGRAMMING SKILLS

Teaching Scheme

Theory – 1Hr. /Week,1Credit

Practical – 2 Hrs./Week,1Credit

Examination Scheme

ISE –25Marks

ICA-25Marks

• **Course Objectives:**

SEC02.01	To introduce the concepts of algorithm & flowchart for developing programming skills required for data analysis
SEC02.02	To formulate simple C programs using various control structures & loop structures
SEC02.03	To apply the concept of arrays to solve the problems
SEC02.04	To apply the concept of functions & pointers to solve the problems
SEC02.05	To apply concept of structures, unions

• **Course Outcomes:** At the end of this course, students will able to

SEC02.01	Design the flowchart and algorithms for the given programming problem
SEC02.02	Implement/Write Pseudo code using C Program by appropriately selecting the control and loop structure
SEC02.03	Implement/Write Pseudo code using C Program using Arrays.
SEC02.04	Implement/Write Pseudo code using C Program using Functions and pointers.
SEC02.05	Implement/Write Pseudo code using C Program using Structures and Unions

Unit No. 01: Fundamentals of Computers & Structure of a 'C' Program:				Hours :03	ICA Marks: 5
<i>Sr. No.</i>	<i>Subunit</i>	<i>ISE Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
1.1	Techniques for Data Analysis for Programming Skills: algorithm, flow chart, examples. Algorithms specifications, formulation of simple algorithms and logical problems.	2	2	Explanation, Formulation	Remember, Understand
1.2	Structure of C program, building blocks of C, program (preprocessor, compilation and execution & debugging of C program), IDE, C character set, tokens, constants, variables, keywords, primitive data types, 'C' operators(arithmetic, unary, binary, ternary, Logical, assignment, relational, increment and decrement, conditional, bitwise, size of)Operator precedence, expressions	2	2	Explanation, Formulation	Remember, Understand
1.3	Typecasting and type conversion, formatting input and output (getchar, putchar, printf, scanf), Storage Classes-Automatic, Register, Static, External storage classes.	1	2	Explanation Application	Understand, Apply
Unit No. 02: Control Structures				Hours: 03	ICA Marks: 4
<i>Sr. No.</i>	<i>Subunit</i>	<i>ISE Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
2.1	Control Statement: if, if-else, nested if –else, else if ladder Loops: while, do-while, for, nesting of loops, break, continue, goto statement, switch-case statement.	4	1	Programming	Understand, Apply,
Unit No. 03: Arrays and Strings				Hours : 03	ICA Marks: 4
<i>Sr. No.</i>	<i>Subunit</i>	<i>ISE Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
3.1	Declaration and initialization of one dimensional array, accessing elements, Array handling. String handling functions. Declaration and initialization of two dimensional arrays, accessing elements, Array handling, Matrix operations	2	2	Programming	Understand, Apply
3.2	Declaration and initialization of strings, Display of strings with different formats, string library function (strlen, strcpy, strcmp, strcat, gets, puts).	2	2	Programming	Understand, Apply

Unit No. 04: Structures and Unions				Hours:03	ICA Marks: 4
<i>Sr. No.</i>	<i>Subunit</i>	<i>ISE Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
4.1	Definition of structure and union, declaration, Accessing elements and displaying elements, difference between structure and union.	4	2	Programming	Understand, Apply
Unit No. 05: Functions				Hours:04	ICA Marks: 4
<i>Sr. No.</i>	<i>Subunit</i>	<i>ISE Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
5.1	<i>Declaration & definition, passing parameters to functions, pass by value, scope of variable, return statement. function using call by value and call by reference</i> <i>Recursion: Processes and Recursion</i>	4	2	Programming	Understand, Apply
Unit No. 06: Pointers				Hours :02	ICA Marks: 4
<i>Sr. No.</i>	<i>Subunit</i>	<i>ISE Marks</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
6.1	Introduction, Declaration of pointer, initialization, accessing pointer, pointer to basic data types,	4	2	Programming	Understand, Apply

- **In Semester Evaluation (ISE):**

In Semester Evaluation (ISE) marks shall be based upon student's performance in three tests conducted & evaluated at institute level.

- **Internal Continuous Assessment (ICA):**

*ICA shall be based on minimum **Eight** experiments similar to below list*

List of Assignments:

1. Fundamentals of algorithm & flowchart, structure of a C program
2. Formatted input/ output functions and different operators in C
3. Control structures - Decision control statement (if, if-else, nested if-else, else if ladder), Loop Statement (for, while, do- while, nested loop) and Switch-case statement
4. Arrays (one-dimensional & two-dimensional)
5. String operations
6. Structures and unions
7. Pointers and dynamic memory allocation
8. Functions (call-by-value & call-by-reference),
9. Recursion

- **Text Books:**

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. Simplifying C – Harshal Arolkar & Sonal Jain, Dreamtech (ForUnit-01)
3. Let s 'C' – Yaswant Kanetkar, BPB Publication
4. Programming in ANSI C- C Balgurusamy, Tata McGraw Hill

- **Reference Books:**

1. The C Programming Language (ANSI C Version), Brian W. Kernighan, Dennis M. Ritchie, PHI Publications
2. Programming in C – B.L. Juneja, Cengage Learning
3. Projects using C- PVN Varalaxmi, Scitech Publications
4. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

- **Web resource:** https://onlinecourses.nptel.ac.in/noc18_cs31/preview



P. A. H. Solapur University, Solapur
First Year B. Tech. (All Branches) Semester-II

CO-CURRICULAR COURSE (CC-02)

PROFESSIONAL PERSONALITY DEVELOPMENT

Teaching Scheme

Theory– 1 Hr. /Week, 1Credit

Practical– 2 Hrs. /Week, 1Credit

Examination Scheme

ISE – 25Marks

ICA– 25Marks

• **Course Objectives:**

01	To develop students' personality
02	To equip students with skills for effective participation in group discussion
03	To equip students with skills for performing effectively in personal interviews
04	To develop students' effective presentations skills
05	To inculcate soft skills among students for professional success
06	To develop students' approach for personal and professional success

• **Course Outcomes:**

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

CO-01	Understand the concept of personality development and do the SWOC analysis.
CO-02	Participate effectively in group discussion.
CO-03	Perform effectively in personal interview.
CO-04	Prepare good quality presentation and deliver it effectively.
CO-05	Inculcate soft skills for professional success.
CO-06	Develop right approach for personal and professional success.

- **Course Curriculum**

Unit No 01: Introduction to Personality Development			Hours: 02	
<i>Sr. No.</i>	<i>Subunit</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
1.1	Need and Importance of Personality Development Guidelines for Personality Development	01	Identification of Steps in Personality Development	Remembering, Understanding, Applying
1.2	Personal SWOC Analysis	01	SWOC analysis exercise	Remembering, Understanding, Applying
Unit No 02: Group Discussion			Hours: 02	
<i>Sr. No.</i>	<i>Subunit</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
2.0	Group Discussion- Introduction, Traits Evaluated, Types, Guidelines for Successful Participation	02	Mock Group Discussion	Remembering, Understanding, Applying
Unit No 03: Personal Interview			Hours: 03	
<i>Sr. No.</i>	<i>Subunit</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
3.0	Introduction, Types of Interviews, Preparatory Steps for Employment Interviews, Guidelines, FAQs During Interviews	03	Mock Personal Interview	Remembering, Understanding, Applying
Unit No 04: Presentation Skills			Hours: 02	
<i>Sr. No.</i>	<i>Subunit</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
4.1	Presentation- Introduction, 4 Ps of Presentation: Planning, Preparation, Practice and Performance	01	Preparing Presentations (4 Ps of Presentation)	Remembering, Understanding, Applying
4.2	Guidelines for Delivering Presentation	01	Presenting the given Topic	Remembering, Understanding, Applying
Unit No 05: Aspects of Personality Development			Hours: 06	
<i>Sr. No.</i>	<i>Subunit</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
5.1	Goal Setting	06	Assessment through presentation, exercise, case study, role play, skit and group activity	Remembering, Understanding, Applying
5.2	Motivation			
5.3	Leadership and Team Work			
5.4	Ethical Values			
5.5	Stress Management			
5.6	Emotional Intelligence			
5.7	Positive Thinking and Attitude			
5.8	Critical Thinking & Decision Making			
5.9	Time Management			

In Semester Evaluation (ISE)–

ISE shall be based upon student's performance in three tests conducted & evaluated at institute level

Internal Continuous Assessment (ICA)-

ICA shall be based on the performance of the student during the practical sessions covering a minimum of 12 exercises out of below-

1. Writing guidelines for personality development
2. Self SWOC analysis
3. Dos and Don'ts of a group discussion
4. Writing views on a topic for group discussion in about 180 words
5. Dos and Don'ts personal interview
6. Writing responses to the frequently asked questions in a personal interview
7. PowerPoint presentation preparation and delivery
8. Writing self-short term and long-term goals
9. Stephen Covey's four quadrants of Time Management
10. Steps in decision making
11. Case study on stress management
12. Case study on success stories, positive thinking
13. Types of Motivation
14. Writing qualities of a good leader

✓ *Note – Students shall be encouraged to use ICT tools for compilation, analysis, report writing and presentation.*

Text Books:

1. Soft Skills: An Integrated Approach to Maximize Personality, Gajendra Singh Chauhan & Sangeeta Sharma, Willy Indian Pvt. Ltd.
2. Professional Speaking Skills. Aruna Koneru. Oxford University Press
3. Hurlock, E.B (2006). Personality Development, 28th Reprint. New Delhi: Tata McGraw Hill.
4. Stephen P. Robbins and Timothy A. Judge (2014), Organizational Behavior 16th Edition: Prentice Hall.

References Books:

1. Soft Skills. K. Alex., S. Chand Publications
2. Soft Skills – A Text book for Undergraduates. Ajay R Tengse, Orient Black Swan
3. Communication Skills Sanjay Kumar Pushpa Lata Oxford University Press
4. Managing Soft Skills for Personality Development, B N Ghosh- McGraw Hill Publication
5. Personality Development- Swami Vivekananda, Advaita Ashram, Kolkata
6. Soft Skills for Managers. Dr. T. Kalyana Chakravarthi & Dr. T. Latha Chakravarthi Biztantra Publication



P. A. H. Solapur University, Solapur
First Year B. Tech (All Branches) Semester II

Indian Knowledge System (IKS)

IKS-01 Introduction to Indian Knowledge System

Teaching Scheme

Theory– 2 Hr /Week, 1Credit

Examination Scheme

ISE – 25 Marks

ICA – 25* Marks

• **Course Objectives:**

01	In this basic course, a special attention is given to the historical prospective of ideas occurrence in the ancient society, and implication to the concept of material world, and religious, social, and cultural beliefs.
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• **Course Outcomes:**

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

IKS-01.1	Creating awareness amongst the youths about the true history and rich culture of the country;
IKS-01.2	Understanding the scientific value of the traditional knowledge of Bhārata;
IKS-01.3	Promoting the youths to do research in the various fields of Bhāratīya knowledge system;
IKS-01.4	Converting the Bhāratīya wisdom into the applied aspect of the modern scientific paradigm;
IKS-01.5	Adding career, professional and business opportunities to the youths.

- **Course Curriculum**

Unit No 01: Number Systems and Units of Measurement Hours : 05				
<i>Sr.</i>	<i>Subunit</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
1.1	1. Number systems in India - Historical evidence 2. Salient aspects of Indian Mathematics	01	Mock Group Discussion	Understanding, applying
1.2	1. Measurements for time, distance, and weight	01	Mock Group Discussion	Understanding, applying
Unit No 02: Introduction to Indian Mathematics Hours : 08				
<i>Sr.</i>	<i>Subunit</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
2.0	1. Introduction to Indian Mathematics 2. Unique aspects of Indian Mathematics 3. Indian Mathematicians and their Contributions 4. Concepts of Zero and Pi, Number System, Pythagoras Theorem, 5. Vedic Mathematics. 6. Magic squares in India	02	Mock Group Discussion	Remembering, understanding, applying
Unit No 03: Indian astronomy Hours : 06				
<i>Sr.</i>	<i>Subunit</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
3.0	1. Introduction to Indian astronomy 2. Indian contributions in astronomy 3. The celestial coordinate system 4. Elements of the Indian calendar 5. Notion of years and months 6. Pañcāᅅga – The Indian calendar system	03	Mock Group Discussion	Remembering, understanding, applying
Unit No 04: Engineering and Technology: Important applications Hours : 07				
<i>Sr.</i>	<i>Subunit</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
4.1	1. Irrigation systems and practices in South India 2. Literary sources for science and technology 3. Physical structures in India 4. Irrigation and water management	01	Mock Group Discussion	Remembering, understanding, applying
4.2	1. Town planning 2. Temples in India: marvelous stone architecture for eternity 3. Temple architecture in India	01	Mock Group Discussion	Remembering, understanding, applying

Unit No 05: Linguistics		Hours :06		
<i>Sr.</i>	<i>Subunit</i>	<i>Hours</i>	<i>Assessment</i>	<i>Bloom's Level</i>
	1. Introduction to Linguistics 2. Aṣṭādhyāyī 3. Phonetics 4. Word generation 5. Computational aspects 6. Mnemonics 7. Recursive operations 8. Rule based operations 9. Sentence formation 10. Verbs and prefixes 11. Role of Sanskrit in natural language processing	06	Mock Group Discussion	Remembering, understanding, applying

- **In Semester Evaluation (ISE)–**

In Semester Evaluation (ISE) marks shall be based upon student's performance in three tests conducted & evaluated at institute level.

- **Internal Continuous Assessment (ICA)-**

**ICA shall be based on submission and evaluation of the activity report writing on Indian Knowledge System.*

- **Text Books:**

- Mahadevan, B., Bhat Vinayak Rajat, Nagendra Pavana R.N. (2022), "Introduction to Indian Knowledge System: Concepts and Applications", PHI Learning Private Ltd. Delhi.
- Textbook on The Knowledge System of Bhārata by Bhag Chand Chauhan,
- History of Science in India Volume-1, Part-I, Part-II, Volume VIII, by Sibaji Raha, et al. National Academy of Sciences, India and The Ramkrishan Mission Institute of Culture, Kolkata (2014).

- **References Books:**

- Pride of India: A Glimpse into India's Scientific Heritage, Samskrita Bharati, New Delhi.
- Sampad and Vijay (2011). "The Wonder that is Sanskrit", Sri Aurobindo Society, Puducherry.
- Bag, A.K. (1979). Mathematics in Ancient and Medieval India, Chaukhamba Orientalia, New Delhi.
- Datta, B. and Singh, A.N. (1962). History of Hindu Mathematics: Parts I and II, Asia Publishing House, Mumbai.
- Kak, S.C. (1987). "On Astronomy in Ancient India", Indian Journal of History of Science, 22(3), pp. 205–221.
- Subbarayappa, B.V. and Sarma, K.V. (1985). Indian Astronomy: A Source Book, Nehru Centre, Mumbai.
- Bag, A.K. (1997). History of Technology in India, Vol. I, Indian National Science Academy, New Delhi.
- Acarya, P.K. (1996). Indian Architecture, Munshiram Manoharlal Publishers, New Delhi.
- Banerjea, P. (1916). Public Administration in Ancient India, Macmillan, London.
- Kapoor Kapil, Singh Avadhesh (2021). "Indian Knowledge Systems Vol – I & II", Indian Institute of Advanced Study, Shimla, H.P.