

Category of Course	Definition	Credits
BSC	Basic Science Courses	18
ESC	Engineering Science Courses	21
HSMC	Humanities and Social Sciences including Mgt.Courses	3
		Total Credits
		42

SHU100 Induction Program

Teaching Scheme: Two weeks mandatory course

Credit : 00

Government College of Engineering, Amravati propose a 2-week long induction program for the UG students entering the institution, right at the beginning of first semester. It will be helpful to students to adjust the new environment and inculcate the spirit of vision and mission of the institution. All students admitted to the B.Tech programme will have to take Induction program as an additional requirement with minimum 75% attendance and be completed within first four semesters.

2 weeks duration
<ul style="list-style-type: none"> •Physical activity •Creative Arts •Universal Human Values •Literary •Proficiency Modules •Lectures by Eminent People •Visits to local Areas •Familiarization to Dept./Branch & Innovations

SHU121 Physics

Teaching Scheme : 03 L + 01T

Total 04

Credit : 04

Evaluation Scheme : 30 MSE + 10 TA + 60 ESE

Total marks : 100

ESE duration : 2 Hrs 30 min.

Course Objectives:

- I. To provide exposure about the basic principles of Physics along with the possible applications.
- II. To develop an insight that provide necessary foundation for scientific thinking and innovation.
- III. To create awareness about vital role played by science & recent advancements in technology.

The propagation of light and geometric optics: Fermat's principle of stationary time and its applications e.g. in explaining mirage effect, laws of Light as an electromagnetic wave and Fresnel equations, reflectance and transmittance, Brewster's angle, total internal reflection, and evanescent wave. Mirrors and lenses and optical instruments based on them

Wave optics: Huygens' principle, superposition of waves and interference of light by wave front splitting and amplitude splitting; Young's double slit experiment, Newton's rings, Michelson interferometer, Mach-Zehnder interferometer. Farunhofer diffraction from a single slit and a circular

aperture, the Rayleigh criterion for limit of resolution and its application to vision; Diffraction gratings and their resolving power

Lasers: Energy levels in atoms, radiation-matter interaction, absorption of light, spontaneous emission of light, Stimulated emission of light, population of energy levels, Einstein A and B coefficients, Metastable state, population inversion, resonant cavity, excitation mechanisms, Lasing action, Properties of laser, characteristics of different types of laser, Types of laser - Solid State Laser: Nd-YAG, Gas Laser: He-Ne, Semiconductor Laser, Applications of Laser in Engineering.

Introduction to Quantum Mechanics: Introduction to Quantum mechanics, Wave nature of Particles, Wave packet, Heisenberg's Uncertainty principle (its experimental illustration), application (non existence of electron in nucleus), wave function, Time-dependent and time-independent Schrödinger wave equations, motion of a free particle, Solution of stationary-state Schrodinger equation for one dimensional problems-particle in a box.

Semiconductor Physics: Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction, Metal-semiconductor junction (Ohmic and Schottky), Semiconductor materials of interest for optoelectronic devices.

Text Books:

1. A Textbook of Engineering Physics, M. N. Avadhanulu, P. G. Kshirsagar, S. Chand, 2016
2. Textbook of Optics, N. Subrahmanyam, Brij Lal, S. Chand, 2006

Reference Books:

1. Optics, A. Ghatak, McGraw Hill Education, 2012.
2. Engineering Physics, Dattu R. Joshi, Mc Graw Hill Education, 2010.
3. Fundamentals of Physics, D. Halliday, R. Resnick, J. Walker, John Wiley & Sons, 2011

Course Outcomes: After completion of course, the student will be able to

SHU121.1 Demonstrate competency, understanding basic concepts & working principles of physics.

SHU121.2 Understand the concepts in modern physics and will be able to apply them.

SHU122 Calculus and Linear Algebra

Teaching Scheme : 03 L + 01T Total 04

Credit: 04

Evaluation Scheme : 30 MSE + 10 TA + 60 ESE

Total marks : 100

ESE duration : 2 Hrs 30 min.

Course Objectives:

- I. To familiarize the prospective engineers with techniques in calculus, multivariate analysis and linear algebra.
- II. To equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Infinite Series: Convergence of series, tests for convergence, Power series, Taylor's series, series for exponential, trigonometric and logarithm functions, Fourier series, Half range sine and cosine series, Parseval's theorem.

Partial Differentiation: Partial derivatives of first and higher orders; total derivative, homogeneous function-Euler's theorem Tangent plane and normal line, Maxima, minima and saddle points, Lagrange's method of undetermined multipliers. Jacobian & its properties

Matrices: Rank of a matrix; Echelon and normal form of a matrix; Homogeneous and nonhomogeneous system of linear equations; Eigen values and eigen vectors, Diagonalization of matrices, Cayley-Hamilton theorem(without proof), and orthogonal transformation.

Complex Numbers: De Moivre's theorem, Roots of equation, Hyperbolic & inverse hyperbolic functions, separation of real & imaginary parts, logarithm of complex numbers.

Special Functions: Beta and Gamma functions and their properties; Differentiation under integral sign; curve tracing (Cartesian and polar).

Text Books:

1. Higher Engineering Mathematics, B. S. Grewal, 43th edition, Khanna publication, new Delhi 2013.
2. A text book of Applied Mathematics, P. N. Wartikar and J. N. Wartikar (Vol I and II), Pune Vidyarthi Griha Prakashan, Pune, 7th Edition, 2003.

Reference Books:

1. Higher Engineering Mathematics, B. V. Ramana, Tata McGraw Hill Publications, 2007.
2. Advanced Engineering Mathematics, H. K. Dass, S. Chand and Sons, 12th edition, 2002.
3. A Text book of Engineering Mathematics, N.P. Bali, Manish Goyal, Laxmi Publications, 7th edition 2008.
4. Advanced Engineering Mathematics, Erwin kreyszig, 9 Edition, John Wiley & Sons, 2006.
5. Calculus and Analytic geometry, G.B. Thomas and R.L. Finney, 9 Edition, Pearson, Reprint, 2002.

Course Outcomes:

The students will be able :

SHU122.1 to apply differential and integral calculus to notions of curvature and to improper integrals and shall have a basic understanding of Beta and Gamma functions.

SHU122.2 to use the tool of power series and Fourier series for learning advanced Engg. Mathematics.

SHU122.3 to deal with functions of several variables that are essential in most of engineering branches

SHU122.4. to use the essential tool of matrices and linear algebra in a comprehensive manner.

EEU 121 Basic Electrical Engineering

Teaching Scheme : 03 L

Total: 03

Credit: 03

Evaluation Scheme: 30 MSE +10 TA+ 60 ESE

Total Marks: 100

Duration of ESE : 2 Hrs.30 min.

DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three- phase balanced circuits, voltage and current relations in star and delta connections.

Transformers: Magnetic materials, BH characteristics, ideal and practical transformer, losses in transformers, regulation and efficiency by direct loading, Auto-transformer and its applications, three-phase transformer connections (Star and Delta)

Electrical Machines: Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators. [No Numericals on this module]

Electrical Installations: Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Suggested Text/Reference Books

1. Basic Electrical Engineering, D.P. Kothari and I.J. Nagrath, Tata McGraw Hill, 2010.
2. Basic Electrical Engineering, D.C. Kulshreshtha, McGraw Hill, 2009.
3. Fundamentals of Electrical Engineering, L. S. Bobrow, Oxford University Press, 2011
4. Electrical and Electronics Technology, E. Hughes, Pearson, 2010.
5. Electrical Engineering Fundamentals, V.D. Toro, Prentice Hall India, 1989.

Course Outcomes

1. To understand and analyze basic electric and magnetic circuits
2. To study the working principles of electrical machines and power converters.
3. To introduce the components of low voltage electrical installations

CEU121 Engineering Mechanics

Teaching Scheme	: 03 L	Total: 03	Credit: 03
Evaluation Scheme:	30 MSE + 10 TA + 60 ESE		Total Marks: 100
Duration of ESE	: 2 Hrs. 30 min.		

Course Objectives: The students will be able

- I. To demonstrate applications of principles of mechanics for solutions of various engineering problems.
- II. To inculcate in students, problem solving abilities and enhance their analytical abilities.
- III. To enhance students' ability to design by solving open ended problems.
- IV. To prepare the students for higher level courses such as Strength of Materials, Electrical Machines, Mechanical Design and Structural Analysis.

Vector Mechanics: Introduction to the principles of mechanics, General Force Systems, Moment of a force about a point and about an axis, Couple and couple moment, Couple moment as free vector, Moment of couple about a line, Resolution and composition of coplanar force system, Reduction of system of forces into a force couple system, Simple resultant, wrench. Resultant and Equilibrium of: Two-dimensional force systems and Three-dimensional force systems

Trusses & Cables: Analysis of simple plane trusses, Method of joints, Method of sections, Static analysis of cables for point loads.

Friction: Concept of friction, impending motion, angle of friction, angle of repose, cone of friction, Coulombs laws of dry friction, wedge blocks, belt friction, Concept of dynamic friction.

Centroid and Centre of Gravity: Centroid of plane areas, second moment of area, and product of inertia, perpendicular and parallel axis theorem, polar moment of inertia, radius of gyration, Principal axes and principal moment of inertia, centre of gravity, mass moment of inertia.

Kinematics: Kinematics of particles: Basic concepts; Rectangular components; Normal and tangential components; Radial and transverse components; motion curves Relative motion; Dependant motion. Kinematics of rigid bodies: Translational motion; Rotation about a fixed axis; General plane motion; Coriolis acceleration, Instantaneous Centre of Rotation.

Kinetics: Kinetics of rectilinear and circular motion of a particle acted upon by a constant and variable force system, Newton's second law; Impulse momentum principle; Central impact; work energy equation for rigid bodies, Energy principles, concept of dynamic equilibrium.

Virtual Work: Work of a force, Principle of Virtual Work and its Engineering Applications.

Text Books:

1. Vector Mechanics for Engineers, Vol. 1 – Statics and Vol. 2 – Dynamics, Beer and Johnston, 8th edition, Tata McGraw Hill International Edition, 2010.
2. Engineering Mechanics, Vol. 1 – Statics 4/e, 1998 and Vol. 2 – Dynamics, Merriam, 5/e, Wiley International, 2001.
3. Engineering Mechanics, by Dr. K. L. Kumar, Tata McGraw Hill Publications, 2011

References Books:

1. Engineering Mechanics, Irving H. Shames, & Rao, Prentice Hall, New Delhi 2010.
2. Engineering Mechanics, Vol. 1–Statics and Vol. 2–Dynamics, Mokoshi, V.S., Tata MGH Books, 1996.
3. Engineering Mechanics, F.L.Singer, HarperCollins Publishers India, 2001
4. Engineering Mechanics, McLean, 3rd Edition, SCHAUM Series, 1995.
5. Engineering Mechanics, Timoshenko and Young, McGraw Hill Publication.
6. Engineering Mechanics, R. C. Hibbeler, Pearson Publishers, 2010
7. NPTEL series of IIT.

Course Outcomes:

After Completion of Course, the student will be able to

CEU121.1 Students shall be able to apply the principles of mechanics for solving the structures like trusses, cables and beams.

CEU121.2 Students shall be equipped with problem solving ability for rigid body mechanics.

CEU121.3 Students shall exhibit various applications of Newtonian Mechanics in their respective engineering disciplines.

CEU121.4 Students shall be clear in fundamentals before going for higher level courses such as Strength of Materials, Electrical Machines, Engineering Thermodynamics, Structural Analysis, Design of Structures, Machine Designs etc.

SHU123 English

Teaching Scheme: 02L

Total: 02

Credit:02

Evaluation Scheme: 60ESE

Total Marks: 60

ESE Duration: 2.30 Hrs

Vocabulary Building: The concept of Word Formation, Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives, Synonyms, antonyms, and standard abbreviations.

Basic Writing Skills : Sentence Structures, Use of phrases and clauses in sentences, Importance of proper punctuation, Creating coherence, Organizing principles of paragraphs in documents, Techniques for writing precisely

Identifying Common Errors in Writing: Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Clichés

Nature and Style of sensible Writing :Describing, Defining, Classifying, Providing examples or evidence, Writing introduction and conclusion

Writing Practices: Comprehension, Précis Writing, Essay Writing

Suggested Readings:

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. On Writing Well. William Zinsser. Harper Resource Book. 2001
4. Study Writing. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.
5. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

Course Outcomes:

The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

SHU124 Physics Lab

Teaching Scheme : 02 P

Total :02

Credit : 1

Evaluation Scheme : Internal Continuous Assessment

Total marks : 50

Course Objectives:

- I. Practical aspect of applied physics explore the relationships between physical parameters, cultivate the habit of inquiry and acquires skills of observation.
- II. Identification of possible errors, analysis and interpretation of data into results.
- III. Introduction to modern scientific and technical tools necessary for professional practice.

This is a representative list of practicals. The student is required to perform minimum eight experiments as per his choice so as to cover entire contents of this course.

List of experiments:

1. Determination of radius of curvature of plano-convex lens by using Newton's rings.
2. Determination of wavelength of spectral lines using diffraction.
3. Determination of grating element-using diffraction of LASER beam.
4. Minimum deviation from a prism.
5. Determination of Specific rotation of optically active liquids.
6. Determination of energy gap in semiconductor.
7. To determine type of semiconductor and Hall coefficient. To determine the carrier concentration and conductivity of a semiconductor using Hall effect.
8. Determination of surface resistivity of given semiconductor by four probes method and study its temperature variation.
9. To determine the Curie temp and relative permittivity of given ferro-electric material.
10. Study of Meissner effect in high TC superconductors and determination of its transition temperature.
11. Study measurement of voltage and frequency using Cathode Ray Oscilloscope.
12. Study characteristics of solar cell at different intensities and determination of maximum workable power.
13. Study of optical fiber characteristics.

Course Outcomes: After completing this course student shall be able to

SHU123.1 Identify probable errors and their rectification.

SHU123.2 Use the techniques, skills and modern engineering tools necessary for professional practice.

EEU122 Basic Electrical Engineering Lab

Teaching Scheme : 02 P

Total: 02

Credit: 01

Evaluation Scheme : Internal Continuous Assessment

Total Marks: 50

List of experiments/demonstrations:

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.

2. Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope). Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.
3. Transformers: Observation of the no-load current waveform on an oscilloscope (non-sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
4. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents). Phase-shifts between the primary and secondary side. Cumulative three-phase power in balanced three-phase circuits.
5. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winding - slip ring arrangement) and single-phase induction machine.
6. Torque Speed Characteristic of separately excited dc motor.
7. Synchronous speed of two and four-pole, three-phase induction motors. Direction reversal by change of phase-sequence of connections. Torque-Slip Characteristic of an induction motor. Generator operation of an induction machine driven at super- synchronous speed.
8. Synchronous Machine operating as a generator: stand-alone operation with a load. Control of voltage through field excitation.
9. Demonstration of Components of LT switchgear.

Laboratory Outcomes:

1. Get an exposure to common electrical components and their ratings.
2. Make electrical connections by wires of appropriate ratings.
3. Understand the usage of common electrical measuring instruments.
4. Understand the basic characteristics of transformers and electrical machines.

ICA - Internal Continuous Assessment shall be based on the practical record and knowledge /skills acquired. The performance shall assess experiment wise by using continuous assessment formats, A and B.

CEU122 Engineering Mechanics Lab

Teaching Scheme	: 02 P	Total: 02	Credit: 01
Evaluation Scheme	: Internal Continuous Assessment		Total Marks: 50

Course Objectives

- I. To verify the principles of mechanics experimentally.
- II. To develop in the students the skill of using graphical methods / Computer programming for the solution of mechanics problems.
- III. To describe the motion of a particle / rigid bodies in terms of its position, velocity and acceleration in different frames of reference.

It is a representative list of practical with minimum seven experiments and minimum three graphical solutions using computer programming. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise.

1. Determination of resultant of coplaner concurrent force system by law of polygon of forces.
2. Determination of reactions at the supports of simple supported beam.
3. Determination of forces in the members of Jib crane.
4. Determination of coefficient of friction between inclined glass planes and different blocks.
5. Determination of coefficient of friction between belt and fixed drum.
6. Determination of mechanical advantage, velocity ratio and efficiency of simple screw jack machine.

7. Determination of mechanical advantage, velocity ratio and efficiency of machine. (Any one machine from differential wheel axle machine, single purchase crabs machine, double purchase crabs machine, worm and worm wheel machine)
8. Experiment on Coriolis acceleration
9. Determination of 'g' by compound pendulum.
10. Determination of moment of inertia of flywheel.
11. Verification of Newton's second law of motion by Fletcher's trolley.
12. Demonstration of direct central impact
13. Verification of Virtual Work Principle
14. Determination of Beam Reactions of a compound beam
15. Motion curves for particles / rigid bodies.

Course Outcomes:

After Completion of Course, the student will be able to

CEU122.1 To know when theory applies and when theory is limited by simplifying assumptions.

CEU122.2 identify reasons why actual measurements will differ from theoretical calculations.

CEU122.3 use the laboratory equipments correctly and safely to perform all experiments

CEU122.4 verify the wide field of engineering mechanics in various engineering applications

SHU125 English Lab

Teaching Scheme: 02P

Total: 02

Credit:01

Evaluation Scheme: Internal Continuous Assessment

Total Marks: 50

Oral Communication

(This unit involves interactive practice sessions in Language Lab)

1. Listening Comprehension
2. Pronunciation, Intonation, Stress and Rhythm
3. Common Everyday Situations: Conversations and Dialogues
4. Communication at Workplace
5. Interviews
6. Formal Presentations

MEU121 Workshop Practice - I

Teaching Scheme : 02P

Total 02

Credit :01

Evaluation scheme: Internal Continuous Assessment

Total Marks: 50

Course Objectives:

- I. To develop skills to prepare carpentry job
- II. To develop skills to prepare gas/arc welding job
- III. To develop skills to prepare sheet metal job
- IV. To develop skills to prepare black smithy job
- V. To develop skills of constructing choke & small transformer windings
- VI. To develop skills of repairs & maintenance of domestic electrical appliances
- VII. To understand different types of wirings & earthing methods

VIII. To identify all parts of a Personal Computer

IX. To assemble a Personal Computer

Group A

Carpentry: Introduction to wood working, kinds of woods, hand tools & machines, Types of joints, wood turning, Pattern making, types of patterns, Pattern making tools.

One job on wood working joint and demonstration of pattern making on wood working lathe.

Welding: Introduction to various welding equipment and welding joints, Demonstration on Gas welding, Electric arc welding, Spot welding, Resistance welding and TIG/MIG welding

One job on Arc welding

Sheet metal: Introduction to primary technology processes involving bending, punching and drawing, sheet metal tools and equipment, their uses, various sheet metal joints, surface development.

One job on sheet metal joint

Group B

Smithy: Introduction to various smithy tools and equipment, Introduction to forging operation,

One job on upsetting, drawing down, flattening

Electrical Workshop: Transformer and choke winding; repair and maintenance of domestic appliances like mixture, grinder, iron, geyser, electric fan, tube light etc.; MCB, ELCB; Different types of wiring. One job on preparation of extension boards, tube light wiring etc.; demonstration of earthing

Computer Hardware Shop : Introduction of Personal/ Micro Computers, PC Main Parts: CPU Box, Monitor & Peripherals, Inside CPU Box. Various terms used in computer memory. Floppy drives, HDD, CD, and SMPS. Identification of cables of computers; Installation of cards, devices and connecting cables

The shops listed in Group A are common to students of all programs and the shops of Group B are allotted as shown below.

Programme Name	Group B	Group A
Civil Engg.	Smithy	
Mechanical Engg.	Smithy	For all branches
Electrical Engg.	Electrical Workshop	
Electronics & TC Engg.	Computer Hardware shop	(Carpentry,
Computer Science & Engg.	Computer Hardware shop	Welding, Sheet
Information Technology	Computer Hardware shop	Metal)
Instrumentation Engg.	Electrical Workshop	

Course Outcomes:

After completion of course students will be able to

MEU123.1 Prepare a job on wood working joints

MEU123.2 Prepare a job using welding operations

MEU123.3 Prepare a sheet metal job

MEU123.4 Prepare a job using smithy operation

MEU123.5 Construct choke & small transformer

MEU123.6 Perform repairs & maintenance of domestic electrical appliances

MEU123.7 Assemble different types of wirings & carry out electrical earthing

MEU123.8 Explain how a PC works, and understand the relationship between hardware and software

MEU123.9 Install, configure, optimize and upgrade personal computers

MEU123.10 Classify and explain the function of different computer hardware components