GOVERNMENT COLLEGE OF ENGINEERING, JALGAON [M.S]

"Globally Accepted Engineers with Human Skills"

(An Autonomous Institute of Government of Maharashtra)

Curriculum for First Year B. Tech. (Common for all branches) 2018-19

Preamble :

The present engineering education needs to improve it's competitiveness and the employability of student community. In this age of information and communication technology the education paradigm is shifting from teaching to learning and the role of teacher is a facilitator. The focus of education should be student centered and thrust should be on learning by the students than
teaching by the faculty. The contact hours should be optimized to enable students to take up self-study to improve his/her skills. The curriculum of all programmes is designed using scientific method and tools of curriculum development and in consultation with various stake holders to satisfy the programme objectives and in consistence with Vision and Mission of Institute in general and that of Department in specific.

Curriculum structure is credit based and evaluation is grade based. The total numbers of credits of four year B.Tech degree programme are 172 with 18 credit in first semester and uniformly distributed over eight semesters, i.e. 22 credits per semester. Continuous assessment process is adopted for evaluation of credit courses. Evaluation of theory course contains three components viz internal sessional assessment (ISA), mid semester examination (MSE) and end semester examination (ESE) while evaluation of practical course contains two components viz internal continuous assessment (ICA based on term work) and end semester examination (ESE). In addition to credit courses; appropriate significance is assigned to co-curricular and extra-curricular activities as audit points for all round development of students.

This curriculum of the First Year B. Tech has been framed on guidelines of AICTE MODEL CURRICULUM 2018, which suggests appropriate importance of basic sciences, basic engineering, branch specific core, humanities, management, core and open elective courses to fulfill the varied needs of the industry. Also as per AICTE directives, Induction Program of three weeks at the beginning of first semester is added as new feature.

Almost every course in the First Year B. Tech structure has undergone some modifications.

The highlights of the present curriculum are listed as follows :

1. Instead of Basic Electronics Engineering course (Theory and Practical) is converted into courses, viz. Basic Electronic and Measurement Techniques.
2. Evaluation of all laboratory courses is 100% internal through continuous evaluation (Internal Continuous Assessment).
3. Introduction of elective shops like electrical shop, computer hardware shop, electronics shop and civil shop along with the conventional shops in the courses General Workshop Practice and Mechanical Workshop Practice are introduced.
4. To improve the communication skill and soft skills of the student Communication Skill is introduced at the first year level itself.
5. Non-credit course Environmental Studies is assigned as audit course.
6. To improve the practical view of the students more lab hours and/or credits are assigned for Engineering Drawing and Drafting Lab and Programming for Problem Solving Lab courses.
7. Total number of courses offered to first year is 10 and the contact hours per week is 22 and 29 or 24 and 27 in first and second semester respectively for different group of courses.

GOVERNMENT COLLEGE OF ENGINEERING, JALGAON

Scheme for Semester I of B. Tech. (Mech/E&Tc/Instru) with effect from academic year 2018-19

Course Code	Name of the Course	Group	Teaching Scheme* Hrs /Week				Evaluation Scheme						Credits
							Theory			Practical		Total	
			L	T	P	Total	ISA	MSE	ESE	ICA	ESE		
SH100AU	**Induction Program**	**Mandatory audit course of three weeks duration as per AICTE model curriculum**											**AU**
SH101U	Differential Calculus	BS	3	1	--	4	10	30	60	--	--	100	4
SH152U	Engineering Physics	BS	3	--	--	3	10	30	60	--	--	100	3
ME151U	Engineering Graphics and Drafting	BE	3	--	--	3	10	30	60	--	--	100	3
CE151U	Engineering Mechanics	BE	3	1	--	4	10	30	60	--	--	100	4
ME152U	General Workshop Practices	BE	--	--	2	2	--	--	--	50	--	50	1
SH153U	Engineering Physics Lab	BS	--	--	2	2	--	--	--	50	--	50	1
ME153U	Engineering Graphics and Drafting lab	BE	--	--	2	2	--	--	--	50	--	50	1
CE152U	Engineering Mechanics Lab	BE	--	--	2	2	--	--	--	50	--	50	1
Total			**12**	**2**	**8**	**22**	**40**	**120**	**240**	**200**	--	**600**	**18**

*** Commencement of first semester of UG engineering program is generally delayed by 4 - 5 weeks as compared with higher semesters due to admission procedure. In addition, as per AICTE directives there is Induction Program of three weeks at the beginning of first semester. Thus the effective teaching in first semester may be only for 8 – 9 weeks. Therefore, one hour per week theory / laboratory teaching should be added in the regular load shown in the curriculum structure so that the syllabus can be completed in 8 - 9 weeks available in first semester of UG program.**

L: Lecture **T:** Tutorial **P:** Practical
ISA: Internal Sessional Assessment **MSE:** Mid Semester Examination
ESE: End Semester Examination **ICA:** Internal Continuous Assessment

Note: 1. ESE (TH) duration for ME151U is four hours and that for all other theory courses is three hours.
2. MSE (TH) duration for all theory courses is two hours
3. Group indicates curriculum component as defined earlier.

GOVERNMENT COLLEGE OF ENGINEERING, JALGAON

Scheme for Semester II of B. Tech. (Mech/E&Tc/Instru) with effect from academic year 2018-19

Course Code	Name of the Course	Group	Teaching Scheme* Hrs /Week				Evaluation Scheme						Credits
							Theory			Practical		Total	
			L	T	P	Total	ISA	MSE	ESE	ICA	ESE		
SH151U	Integral Calculus	BS	3	1	--	4	10	30	60	--	--	100	4
SH102U	Engineering Chemistry	BS	3	--	--	3	10	30	60	--	--	100	3
EE101U	Elements of Electrical Engineering	BE	2	--	--	2	10	30	60	--	--	100	2
ET151U	Basic Electronics and Measurement Techniques	BE	3	--	--	3	10	30	60	--	--	100	3
CO101U	Programming for Problem Solving	BE	3	--	--	3	10	30	60	--	--	100	3
SH104U	Communication Skills	HM	1	--	--	1	05	15	30	--	--	50	1
SH105U	Communication Skills Lab	HM	--	--	2	2	--	--	--	50	--	50	1
ME101U	Mechanical Workshop Practices	BE	--	--	2	2	--	--	--	50	--	50	1
SH103U	Engineering Chemistry Lab	BS	--	--	2	2	--	--	--	50	--	50	1
EE102U	Elements of Electrical Engineering Lab	BE	--	--	2	2	--	--	--	50	--	50	1
ET152U	Basic Electronics and Measurement Techniques Lab	BE	--	--	2	2	--	--	--	50	--	50	1
CO102U	Programming for Problem Solving Lab	BE	--	--	2	2	--	--	--	50	--	50	1
SH150AU	**Environmental Science**	**Mandatory audit course in self learning mode equivalent to study of 3 hrs/week**							100	--	--	100	AU
		Total	**15**	**1**	**12**	**28**	**55**	**165**	**330**	**300**	--	**950**	**22**

L: Lecture **T:** Tutorial **P:** Practical

ISA: Internal Sessional Assessment **MSE:** Mid Semester Examination

ESE: End Semester Examination **ICA:** Internal Continuous Assessment

Note: 1. ESE (TH) duration for SH104U is two hours and that for all other theory courses is three hours.

2. MSE (TH) duration for SH104U is one hours and that for all other theory courses is two hours

3. Group indicates curriculum component as defined earlier.

GOVERNMENT COLLEGE OF ENGINEERING, JALGAON

Scheme for Semester I of B. Tech. (Elect/Comp/Civil) with effect from academic year 2018-19

Course Code	Name of the Course	Group	Teaching Scheme* Hrs /Week				Evaluation Scheme						Credits
							Theory			Practical		Total	
			L	T	P	Total	ISA	MSE	ESE	ICA	ESE		
SH100AU	**Induction Program**	**Mandatory audit course of three weeks duration as per AICTE model curriculum**											**AU**
SH101U	Differential Calculus	BS	3	1	--	4	10	30	60	--	--	100	4
SH102U	Engineering Chemistry	BS	3	--	--	3	10	30	60	--	--	100	3
EE101U	Elements of Electrical Engineering	BE	2	--	--	2	10	30	60	--	--	100	2
CO101U	Programming for Problem Solving	BE	3	--	--	3	10	30	60	--	--	100	3
SH104U	Communication Skills	HM	1	--	--	1	05	15	30	--	--	50	1
SH105U	Communication Skills Lab	HM	--	--	2	2	--	--	--	50	--	50	1
ME101U	Mechanical Workshop Practices	BE	--	--	2	2	--	--	--	50	--	50	1
SH103U	Engineering Chemistry Lab	BS	--	--	2	2	--	--	--	50	--	50	1
EE102U	Elements of Electrical Engineering Lab	BE	--	--	2	2	--	--	--	50	--	50	1
CO102U	Programming for Problem Solving Lab	BE	--	--	2	2	--	--	--	50	--	50	1
		Total	**12**	**1**	**10**	**23**	**45**	**135**	**270**	**250**	--	**700**	**18**

*** Commencement of first semester of UG engineering program is generally delayed by 4 - 5 weeks as compared with higher semesters due to admission procedure. In addition, as per AICTE directives there is Induction Program of three weeks at the beginning of first semester. Thus the effective teaching in first semester may be only for 8 – 9 weeks. Therefore, one hour per week theory / laboratory teaching should be added in the regular load shown in the curriculum structure so that the syllabus can be completed in 8 - 9 weeks available in first semester of UG program.**

L: Lecture **T:** Tutorial **P:** Practical
ISA: Internal Sessional Assessment **MSE:** Mid Semester Examination
ESE: End Semester Examination **ICA:** Internal Continuous Assessment

Note: 1. ESE (TH) duration for ME151U is four hours and that for all other theory courses is three hours.
2. MSE (TH) duration for all theory courses is two hours
3. Group indicates curriculum component as defined earlier.

GOVERNMENT COLLEGE OF ENGINEERING, JALGAON

Scheme for Semester II of B. Tech. (Elect/Comp/Civil) with effect from academic year 2018-19

Course Code	Name of the Course	Group	Teaching Scheme* Hrs /Week				Evaluation Scheme						Credits
							Theory			Practical		Total	
			L	T	P	Total	ISA	MSE	ESE	ICA	ESE		
SH151U	Integral Calculus	BS	3	1	--	4	10	30	60	--	--	100	4
SH152U	Engineering Physics	BS	3	--	--	3	10	30	60	--	--	100	3
ME151U	Engineering Graphics and Drafting	BE	3	--	--	3	10	30	60	--	--	100	3
ET151U	Basic Electronics and Measurement Techniques	BE	3	--	--	3	10	30	60	--	--	100	3
CE151U	Engineering Mechanics	BE	3	1	--	4	10	30	60	--	--	100	4
ME152U	General Workshop Practices	BE	--	--	2	2	--	--	--	50	--	50	1
SH153U	Engineering Physics Lab	BS	--	--	2	2	--	--	--	50	--	50	1
ME153U	Engineering Graphics and Drafting lab	BE	--	--	2	2	--	--	--	50	--	50	1
ET152U	Basic Electronics and Measurement Techniques Lab	BE	--	--	2	2	--	--	--	50	--	50	1
CE152U	Engineering Mechanics Lab	BE	--	--	2	2	--	--	--	50	--	50	1
SH150AU	**Environmental Science**	**Mandatory audit course in self learning mode equivalent to study of 3 hrs/week**							100	--	--	100	AU
		Total	**15**	**02**	**10**	**27**	**50**	**150**	**400**	**250**	**--**	**850**	**22**

L: Lecture **T:** Tutorial **P:** Practical
ISA: Internal Sessional Assessment **MSE:** Mid Semester Examination
ESE: End Semester Examination **ICA:** Internal Continuous Assessment

Note: 1. ESE (TH) duration for ME151U is four hours and that for all other theory courses is three hours.
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SH100AU INDUCTION PROGRAM

Teaching Scheme: 40 Hrs/Week for first three weeks **Credit:** 00

Course Description

The graduating student must have knowledge and broad understanding of society and relationship. Character needs to be nurtured as an essential quality by which the students will understand and fulfill their responsibility as an engineer, a citizen and a human being. In addition, several meta-skills and underlying values are needed. This course is designed by A.I.C.T.E. to fulfill all these requirements and inculcate the desired qualities among students community.

Course Objectives

1. Help students to adjust the new environment of engineering education.
2. Inculcate the philosophy of the institution.
3. Familiarize with physical fitness activities.
4. Improve creativity and thinking ability and find out hidden talent.
5. Inculcate the essence of human skills including professional ethics.
6. Understand the industrial/professional scenario.

Course Outcomes

Upon successful completion of this course the students will:

1. be comfortable with the environment of institute and engineering education.
2. know vision, mission of institute and the department.
3. be able to maintain physical and mental fitness through regular practice of various activities learnt during the course.
4. demonstrate improved skills, creativity and reasoning ability.
5. understand and analyse his/her personality and plan for its development.
6. demonstrate improved universal values and human skills in profession and life.
7. **The relevance of PO's and strength of co-relation:**

PO	1	2	3	4	5	6	7	8	9	10	11	12
CO1	√	√	√	√	√	√	√		√	√	√	√
CO2						√	√	√				√
CO3									√			√
CO4	√	√			√	√	√		√	√	√	√
CO5			√			√	√	√	√	√		√
CO6			√			√	√	√	√	√	√	√

Course Content

Physical Activities (at least 50 minutes every day): Any one activity from exercise on ground, aerobics, yoga, pranayam, meditation, etc.

Creative Art (approximately 2 hrs every day): Familiarization with any 4 – 5 creative arts through 2 hrs per day training and identification of the area of interest in which practice can be continued as a hobby for mental relief and satisfaction. Suggestive list (but not limited to) drawing, sketching, painting, dancing, singing, acting, public speaking, rangoli, mehendi,

cooking, paper craft, mural making, model making, small circuit making, music instrument playing, etc

Universal Human Values (approximately 2 hrs every day): Familiarization with various Universal Human Values through interactive lectures (it should not be just like do's and don'ts), group discussion, presentation, role play, audio/video aids (movies, clips, live shows, etc), real life activities, observation of surrounding, etc.
Expected human values includes (but not limited to) introduction to universal human values, problems and prospects of engineering, heritage of our country and state, education for society, communication skills, body language, interpersonal relation, personality and its analysis, Indian culture, attitude, personality development, moral values, professional ethics, lifelong learning, mind concentration, independent study techniques, etc.

Literary (approximately 1 hrs per day for 5 – 6 day): This activity should include reading and writing skills, familiarization with library system, elocution, debate, role play, etc

Proficiency Module (approximately 1 hrs per day for 5 – 6 day): This period should be used to overcome some critical lacuna that students might have for example applied mathematics, English, logical thinking and reasoning ability, computer familiarization, etc.

Lectures by Eminent People (approximately 1.5 hrs per day for 4 – 5 day): This period should be utilized for lectures by eminent people to give exposure to people who are successful, socially active or in public life. This should motivate students and help to expand the horizon of their vision toward life.

Familiarization of Department (approximately 1.5 hrs per day for 5 – 6 day): This period should be utilized for familiarizing students with vision, mission, PEOs, Pos, PSOs, etc; infrastructural facilities like various laboratories, workshops, class rooms, seminar hall, departmental library, etc; scope of curriculum; future scope of the branch; etc.

Visit to Local Area (around three visits during the program): This may include visits to landmark of the city/hospital/orphanage; industry/site/organization (if possible related to the branch); and visit to nearby picnic spot/historical place.

Special Lectures (approximately 1.25 to 1.5 hrs per day for 5 – 6 day): This period should be utilized for lectures by expert people to give exposure to improve life style, habits, vision, etc of the students.

Indoor / Outdoor Games (approximately 1.25 to 1.5 hrs per day for 5 – 6 day): During this period the students may allow utilizing various gymkhana facilities or playing ground and play the various games of their interest. This can be used find out hidden talent of the students in sports activities.

SH101U: DIFFERENTIAL CALCULUS

Teaching Scheme: 03L+01T
Evaluation Scheme: 30MSE +10ISA + 60ESE **Credit:** 04
Duration of ESE: 03 Hrs. **Total Marks:** 100

Course Description:
This course provides knowledge about basic engineering mathematics to familiarize students with complex numbers and its application, matrices, differential calculus, partial differentiation, solid geometry.

Course Objectives:
Main objective is to give adequate exposure of basics of engineering mathematics so as to enable them to visualize engineering problems by using mathematical tools and to support their subsequent engineering studies.

Course Outcomes:
Upon successful completion of this course the students will be able to

1. understand and apply the concepts of complex numbers to support their subsequent engineering studies.
2. understand and apply theory of matrices to support their subsequent engineering studies.
3. understand and apply the concept of univariate calculus to support their subsequent engineering studies.
4. understand applies the concept of multivariate calculus to support their subsequent engineering studies.
5. understand applies the concept of Sphere, Cone & Cylinder to support their subsequent engineering studies.

Relevance of PO's and strength of co-relation:

PO	1	2	3	4	5	6	7	8	9	10	11	12
CO1	√	√		√								
CO2	√	√		√								
CO3	√	√		√								
CO4	√	√	√	√								
CO5	√	√		√								

Course Content

Complex numbers and its application: Complex numbers: definition and properties, Argand's diagram, De Moivre's theorem and its applications to find roots of an algebraic equations, hyperbolic and inverse hyperbolic function, logarithm of complex numbers, separation into real and imaginary parts.

Matrices: Inverse & rank of matrix, rank nullity theorem (statement), reduction to normal forms, linear system of equations, Eigen values and Eigen vector's, Cayley-Hamilton theorem, linear transformation and orthogonal transformations, applications: translation and rotational matrix

Differential Calculus: Rolle's theorem, mean value theorem, successive differentiation, Leibnitz's theorem, expansion, Taylor's and Maclaurin's series, expansion standard function's, indeterminate forms, L-hospital rule and its applications, maxima and minima.

Partial Differentiation: Limit**,** continuity**,** partial derivatives: definition and properties, direct differentiation, chain rule's, total differentiation, Euler's theorem for homogeneous functions, implicit function, change of independent variables, Laplace operator, Jacobians: definition, properties and applications, maxima and minima for a function of two variables, Lagrange's method of undetermined multiplier's, applications to errors and approximations.

Solid Geometry: Cartesian, spherical and cylindrical co-ordinate system, sphere, cone and cylinder.

Text books:

1. P. N. Wartikar and J. N. Wartikar, A text book of Engineering Mathematics (Vol-I and II), 7th edition, Pune Vidhyarthi Griha Prakashan, Pune, 2013.
2. N. P. Bali & Manish Goyal, A text book of Engineering Mathematics, 9th edition, Laxmi Prakashan, 2014.

Reference books:

1. Dr. B. S. Grewal , Higher Engineering Mathematics, 33rd edition, Khanna Publication, New Delhi, 1996.
2. H.K.Dass ,Advanced Engineering Mathematics, 12thS.Chand Publication, New Delhi, 2003.
3. Erwin Kreyszing, Advanced Engineering Mathematics (8th Edition) by, Willey Ltd. Mumbai, 2013. Eastern
4. B. V. Ramana , Higher Engineering Mathematics, 12th edition, Tata McGraw Hill Publication, New Delhi, 2011.

SH152U: ENGINEERING PHYSICS

Teaching Scheme: 03L + 00T
Evaluation Scheme: 30MSE +10ISA+ 60ESE **Credit:** 03
Duration of ESE: 03Hrs **Total marks:** 100

Course Description:
This course provides knowledge about basic engineering physics to familiarize students with optics, quantum physics, semiconductor and magnetic materials, acoustic, ultrasonic and introduction to nanotechnology.

Course objectives:

1. To understand the Importance of applications of Applied Physics in daily life
2. To provide students with a basic understanding of the Physics that may be required by engineers in the course of their careers
3. To enhance knowledge related to optics, Fibre Optics, Lasers and its different components to make it suitable for various purposes
4. To introduce the learners to the basics of Quantum Mechanic, acoustics and ultrasonic.
5. To introduce the most important concepts of superconductivity, magnetic materials and fiber optics to the students
6. To provide an insight into the latest topic of research "nanophysics"

Course Outcomes:
Upon successful completion of this course, the students will be able to

1. understand the importance of Applied Physics in describing physical phenomena.
2. recognize the use of optics, Laser in various fields.
3. implement the concept of Quantum mechanics for research applications.
4. employ the knowledge of superconductivity and magnetic materials to understand the structure-property relationship of materials.
5. students will be able to understand the methods of production of ultrasonic waves.
6. acquire Basic knowledge of Nanophysics for its applications in the field of medicine, data storage devices and electronics.

The relevance of PO's and strength of co-relation:

PO	1	2	3	4	5	6	7	8	9	10	11	12
CO1	√											
CO2	√					√						
CO3	√	√										
CO4	√											
CO5	√											
CO6	√											

Course Content

Optics
Interference: Concept of the thin film, Newton's ring, Michelson Interferometer, application of interference in the determination of wavelength and refractive index, testing of optical flatness of the surface, antireflection coating.
Diffraction: Fraunhofer and Fresnel diffraction, Fraunhofer Diffraction at single slit, diffraction grating, resolving power of a grating.

Polarization: Polarization by reflection, Brewster's law, Nicol Prism,polaroid's, engineering application of polarization.

LASER: Absorption, spontaneous and stimulated emission, a metastable state, population inversion, a pumping mechanism, an optical resonator, LASER beam characteristics, He Ne gas LASER, Nd- YAG Laser, applications of LASER in science, engineering,and medicine.

Quantum Physics

De-Broglie hypothesis, Heisenberg's uncertainty principle (its experimental illustration), wave function, Schrödinger wave equations (Time-dependent and time independent), applications of Schrödinger wave equations (motion of a particle in a one-dimensional potential well, harmonic oscillator)

Physics of Semiconductors and Magnetic materials

Band theory of solids, classification of solids on the basis of band theory, the conductivity of semiconductors, fermi level, the formation of p-n junction diode, working of the diode, hall effect.

Magnetic materials– types and properties, the theory of magnetism,hysteresis, hard and soft magnetic materials, applications.

Acoustic and Ultrasonic

Loudness – decibel – reverberation time – Sabine's formula – factors affecting the acoustics of the building, reverberation time, loudness, echo

Ultrasonic: properties of ultrasonic waves – ultrasonic production – magnetostriction method – the piezoelectric method, applications (determination of depth of the sea, measurement of velocity).

Introduction to nanotechnology

Introduction of nanotechnology, properties of nanoparticles (optical, electrical,magnetic,structural, mechanical), a brief description of different methods of synthesis of nanomaterials (physical and chemical methods), classification of nanomaterials, Synthesis process-bottom-up Approach - e.g. Chemical bath deposition (CBD), Successive Ionic Layer adsorption Reaction (SILAR), Sol Gel. Applications of nanotechnology, advantages,and limitations of nano-materials.

Textbooks:

1. D Halliday, R Resnik, J Walker, Fundamentals of Physics, John Wiley and Sons Inc. 6th Edition, 2000
2. MN. Avadhanulu, Kshirsagar, Text Book of Engineering Physics, 9th Edition, S.Chand publication 2010
3. V. Rajendran, Engineering Physics, 1st Edition Tata McGraw Hill. 2010

Reference Books:

1. F. A. Jenkins, H. E. White, Fundamentals of Optics, Mc-Graw Hill Publications, 4th Edition, 2001.
2. A Beiser, Concepts in Modern Physics, Tata Mcgraw Hill Publication,5th Edition, 2001.
3. F K Richtmyer, E H Kennard, J N Cooper, Introduction to Modern Physics Tata Mcgraw Hill Publication, 6th Edition, 1997
4. C Kittel, Introduction to Solid State Physics, J Wiley and Sons. Inc., 7th Edition, 2005.
5. S K Kulkarni, "Nanotechnology, principles & Practices", Capital Publication Co. New Delhi, 2007

ME151U ENGINEERING GRAPHICS & DRAFTING

Teaching Scheme: 03L +00T,
Evaluation Scheme: 30 MSE+ 10 ISA+ 60 ESE **Credit : 03**
Duration of ESE: 04 Hrs. **Total marks : 100**

Course Description:
Engineering Graphics is a basic course for all undergraduate Engineering program. This course provides the elementary level knowledge of technical Geometry that is engineering drawing. This course is therefore introduced to provide the basic understanding of the fundamentals of Engineering Drawing, mainly visualization, graphics theory, standards and conventions of drawing, the tools of drawing and the use of Drawings in engineering applications. Course includes in briefs that introduction to Engineering Drawing, Orthographic Projection, Isometric view and Isometric Projection, line planes, solids and Development of solids

Desirable awareness/skills:
Fundamental knowledge of Geometry, mechanics

Course Objectives:
1. Develop the manual drawing skill.
2. Develop drawing interpretation skill.
3. Develop the physical realization of the dimension of the objects.

Course Outcomes:
Upon successful completion of this course, the students will be able to
1. develop imagination of physical objects to be represented on paper for engineering communication by applying principles of ortho. Projection methods and Isometric projections methods to simple and complex mechanical engineering applications in practice
2. find various dimensional parameters of line, plane, solids etc by drafting .
3. develop the lateral surface of various regular solids in engineering applications.

Relevance of COs /POs and strength of co-relation:

Course Code	COs	POs											
		1	2	3	4	5	6	7	8	9	10	11	12
EG151U	CO 1	✓	✓	✓	-	-	-	-	-	-	✓	-	-
	CO 2	-	-	✓	-	-	-	-	-	-	✓	-	✓
	CO 3	-	✓	-	✓	-	-	-	-	-	✓	-	-

Course Content

Projections of Lines
Projections of Straight Lines: Introduction to point, Projections of points in four quadrants, projections of points in reference plane, Introduction and concept of line, line position cases:- line parallel to both the reference planes, line parallel to one reference plane and perpendicular to the other, line inclined to one reference plane and parallel to the other, line

inclined to both the reference planes. Applications exercise on line inclined to both reference planes. Introduction to traces of line. (No problems on traces of line).

Projections of Planes

Projections of planes: Introduction and concept of shapes or forms of various types Plane, cases: surface parallel to one reference plane and perpendicular to other reference plane, plane surface inclined to one reference plane and perpendicular to other reference, projections of planes inclined to both reference planes. (Problems shall be exercised on all above case as well as application and may solved either by change of position method or Auxiliary Plane method).

Projections of Solids

Projections of Solids: Introduction to solids: prisms, pyramid, cylinder, cone, cube, tetrahedron, Projections of above solids with axis inclined to one plane, projections of above solids with axis inclined to both the planes, projection of composite solids. (Problem shall be on all above cases and exercised either by change of position method or auxiliary plane method).

Development of Lateral surfaces

Introduction, Concept and significance of Development of surfaces and lateral surfaces, Development of lateral surfaces of all types of regular prisms, pyramids, cones and cylinders Cases: - shall be exercised as: - solid surface/s are cut by various ways such as single cutting plane line (C-P line), two parallel C-P lines, Two Non-parallel C-P lines, Two Intersecting C-P lines and Underneath cuts of any shape on surfaces of solids (parallel and radial method only).

Orthographic Projections

Types of lines, methods of dimensioning and types of dimensioning, Principle of orthographic projections (First and third angle orthographic projection methods) Exercise shall be consist of orthographic projection of different machine / mechanical components; problem shall be on first and third angle ortho. Proj. Methods, all types sectional orthographic projections (First and third angle orthographic projection methods). Sectional orthographic projections (view) problem shall be exercised on single cutting plane line.

Isometric view and Projections

Isometric Views: Introduction to pictorial views, isometric scale, isometric projections and its classification, And exercise consist of problems on simple and complex mechanical object which shall be solved by Isometric view and isometric projection methods.

Drafting Technology and Introduction to Drafting Software/Package CAD [Choosing and learn all basic of suitable one drafting CAD software (any one)]

Introduction to CAD software, Advantages of CAD packages, applications of CAD, the theory of CAD software consisting of basic operation of drafting packages, use of various commands for drawing, dimensioning, editing, modifying, saving and printing/plotting the drawings. Introduction to 3D primitives.

Note : (The CAD based questions shall be excluded from theory ESE, it will be included only in lab ICA ME153. And except the basic essential concepts of CAD, most of the teaching part of same shall be conduct concurrently in the laboratory practical hours with practice of different exercises).

Text Books:

1. H. G. Phakatkar, Engineering Graphics with an introduction to computer aided drafting, vol. I & II, Nirali Prakashan, Pune, 7th edition, India, 1997.
2. P.J. Shah, A Text book of Engineering Drawing, S. Chand & company Ltd., New Delhi. 2009.
3. R. V. Mali, Chaudhari, Engineering Drawing, Vrinda Publication, Jalgaon, 1998 onwards.
4. Kulkarni, D. M., Rastogi, A. P. and Sarkar, A. K.,Engineering Graphics with AutoCAD, PHI, India, 2009.
5. K. Venugopal, Engineering Drawing and Graphics, 3rd edition, New Age International, 1998. Publishers, New Delhi, 2007.
6. Haravinder Singh, Fundamental of Engineering Drawing and computer Graphics, 3rd edition, Dhanpat Rai Publication Co, New Delhi, India.

Reference Books:

1. Bhatt N. D., Panchal V. M., Engineering Drawing, Charotar Publishing House 2008 onwards
2. Dhabhade M. L., Engineering Graphics, Vol.-I and Vol.-II, Vision Publications 2003 onwards
3. P.S Gill,Engineering drawing –S. K. Kataria publication.2012 onwards.
4. Dhananjay A. Jolhe, Engineering drawing, TMH, 2008.
5. T. E. French, C. J. Vierck and R J Foster, Graphic Science and Design, 4th edition, McGraw Hill, 1984.
6. W J Luzadder and J M Duff, Fundamentals of Engineering Drawing, Fundamentals of Engineering Drawing, 11th edition, Prentice-Hall of India, 1995.

CE151U ENGINEERING MECHANICS

Teaching Scheme : 03L + 01T **Credit :** 04
Evaluation Scheme : 30 MSE + 10 ISA + 60 ESE **Total marks :**100
Duration of ESE : 3Hrs

Course description: This course provides the elementary level knowledge of Engineering and Engineering mechanics which includes study of forces and force systems, Resultant and equilibrium of coplanar force systems, friction, Kinematics and kinetics of bodies, Concept of stress strain and SFD/ BMD.

Objectives: To enable the students understand the basic concepts of mechanics such as force, equilibrium, moment etc and to analyze simple determinate structures like beam and truss.

Course Objectives (CO)

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

1. to introduce concept of engineering mechanics and its applications.
2. to study equilibrium of rigid bodies, friction, beam with different supports and loadings.
3. to study types of trusses and analysis of simple truss.
4. to study how to find out centroid, moment of inertia of plane and composite bodies.
5. to study linear motion and momentum principle.
6. to study shear force and bending moment diagram in simple beam and loadings.
7. to study stress strain characteristics.

Relevance of COs /POs and strength of co-relation:

	1	2	3	4	5	6	7	8	9	10	11	12
CO1	√			√			√	√	√			√
CO2			√								√	
CO3		√			√							
CO4					√				√		√	
CO5		√							√			
CO6		√		√					√			
CO7	√		√									

Course content:

Introduction to Engineering Mechanics: Basic concept, Principles of Mechanics, Force types and Force System, composition and Resolution of forces, Resolution of Concurrent force System in Plane, Moment of forces/ Couple, Varignon's theorem, Equivalent Force system, Resultant of Non-Concurrent Force System in plane, Introduction to Space forces, Resultant of Concurrent Forces system in Space.

Equilibrium of Force System: Particle equilibrium in 2d/3d, rigid body equilibrium, type of supports and Loads, Free body diagram, Conditions and equations of equilibrium , Equilibrium of forces in Plane, Equilibrium of concurrent force system in space, Lami's theorem, Reactions of determinate beams.

Center of Gravity: Introduction, center of Gravity / centroid of simple figures / composite sections, centre of gravity and its implications.

Moment of Inertia: Introduction, definition, moment of inertia of plane sections / standard sections /composite sections, theorem of moment of Inertia, mass moment of inertia of circular plate, cylinder, cone, sphere and hook.

Basic Structural Analysis :-Equilibrium in three dimensions**,** method of Joints , method of sections, simple trusses, beams, types of beams, frames.

Friction: Introduction, types of friction, limiting friction, Laws of friction, simple and dynamic friction, motion of bodies, wedge friction, screw jack / differential screw jack.

Internal Forces in simply supported and cantilever member for point load and udl, Determination of variation of axial force (Axial force diagram), Shear force (Shear force diagram), Bending moment (Bending moment diagram) and twisting moment.

Concept of Stress and Strain: Normal and shear stress and strain, state of stress at a point, stress strain curve, Hook's law, modulus of elasticity, poisson's ratio, modulus of rigidity, bulk modulus, transformation stress.

Kinematics of Particles: Motion related to cartesian coordinates.

Kinetics of Particles: Newton's second law, energy principles, Impulse momentum principle.

Virtual Work and Energy Method: Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies.

Tutorials

1. To find the various forces and angles including resultants in various parts of wall crane and roof truss.
2. To verify the law of polygon for various forces.
3. To find coefficient of friction between various materials on inclined plan.
4. Free body diagrams various systems including block-pulley.
5. To verify the principle of moment.
6. To draw a load efficiency curve for a screw jack.
7. To draw SFD and BMD of simply supported /cantilever beams for given loading.
8. To verify the Hook's law.
9. To study energy principles.
10. To study principle of virtual work.

Text Books:

1. Bhavikatti S.S, Engineering Mechanics, New Age International Publications, 4th edition, 2013.
2. F. P. Beer and E. R. Johnston, Vector Mechanics for Engineers Vol I-Statics, Vol. II-Dynamics, Tata McGraw Hill 9th Ed, 2011.
3. Stephen Timoshenko, Strength of Materials Part -1, CBS Publishers and Distributors, New Delhi, 2000.
4. Singer F.L. and Andrew Pytel, Strength of Material, Harper and Row Publishers, New York.

5. R. K. Bansal, A Text Book of Engineering Mechanics, Laxmi Publication New Delhi, 6th edition, 2013

Reference Books:

1. Irving H. Shames, Engineering Mechanics, Prentice Hall, 4th Edition, 2006.
2. R.C.Hibbler, Engineering Mechanics, Pearson Press,4th edition, 2006.
3. Andy Ruina and Rudra Pratap, Introduction to Statics and Dynamics, Oxford University Press, 2011,
4. Hibler and Gupta, Engineering Mechanics , Pearson Education 11th edition, 2010.
5. Reddy Vijaykumar K. and K. Suresh Kumar, Engineering Mechanics, Singer's, 3rd edition 2011.
6. Ramamrutham, A Text Book of Engineering Mechanics, Dhanpatrai Publications, 8th edition, 2008.
7. Shanes and Rao, Engineering Mechanics, Pearson Education 2006.

Useful Links

1. NPTEL, www.nptel.ac.in
2. www.sasi.ac.in/mech
3. myengineeringmechanics.com
4. study.com/directory/category/engineeringmechanics
5. schanpublishing.com

ME 152U GENERAL WORKSHOP PRACTICES

Teaching Scheme: 2P Credit: 01
Evaluation Scheme: ICA: 50 marks Total Marks: 50
Practical hrs: 02 Hrs

Course Description
The course intends to make students familiar with the basic Workshop operations that are widely used in day to day life, such as Carpentry, Sheet Metal. Further it intends to offer fundamental knowledge of equipment used in Electrical workshop. It also covers most of the widely used Computer peripherals and their operations and fundamental equipment used by a Civil engineer.

Desirable awareness/skills:
Fundamental knowledge of Physics, Mathematics, Electrical and Computer sciences.

Prerequisite
The fundamental knowledge of mathematics and computer systems.

Course Objectives:
The Student should able to:

1. learn the fundamental principles of various carpentry operations.
2. understand various operations in sheet metal shop.
3. apply the fundamental electrical principles to the working of most common electrical equipment used in day to day life.
4. make use of most common computer peripherals.

Course outcomes:
On successful completion of this course student shall be able to:

1) to perform basic wood turning operations.
2) to prepare simple sheet metal job (based on real life applications)
3) to understand the operations of most common electrical appliances.
4) to make use of widely used computer peripherals.
5) use the basic tools like planimeter, dumpy level used by a civil engineer.

Relevance of COs /POs and strength of co relation:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1			√									
CO 2			√									
CO 3	√			√								
CO 4	√	√			√							
CO 5	√	√										

Course Content

Students entering in workshop must perform following practical's

1) Carpentry Shop.
Introduction to wood working, kinds of woods, hand tools and machines, Types of joints, wood turning, to instruments like Steel rule, Callipers, Vernier Calliper, Micrometre.
One job involving joint and wood turning.

2) Sheet Metal Shop.
Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.
One job on commercial items such as Dust bin, funnel, tray etc.

3) Electrical Workshop.
Introduction and difference between 1 φ ac, dc supply. Transformers; repair and maintenance of domestic appliances like electric fan, tube light etc. MCB, ELCB; different types of wiring, demonstration on preparation of extension boards, tube light wiring etc; demonstration of earthling and neutral.

4) Computer Workshop.
Introduction and identification of hardware components of a typical computer system. Assembling and Disassembling the PC. Handling and operating peripheral devices like printer, scanner, pen drives, CD-ROM, Multimedia Devices, UPS etc.

5) Electronics Workshop.
Demonstration and use of electrical and electronics hand and power tools. Measurement of resistance, capacitance, voltage and frequency.
Assembly of Electronic components on the printed circuit board (PCB)/Bread Board.

6) Civil
Study and use of Chain and tape, Levelling staff and Dumpy level, Planimeter and Measurement of height of building.

Text Books

1. M.S. Mahajan, Metrology and Quality Control, Dhanpat Rai and sons, Delhi. 2008 onwards.
2. Hajara Chaudhary, Bose S K, Element of Workshop Technology, Volume I and II, Asia Publishing House. 1997 onwards.
3. B. L. Theraja, Fundamentals of Electrical Engineering, 27^{th} edition, S Chand Publishers, 1996.

Reference Books

1. Chapman W. A. J., Workshop Technology, CBS Publication. 1986 onwards.
2. T. P. Kanetkar and S. V. Kulkarni, Surveying and leveling Part 1, Pune Vidyarthigriha Prakashan, 2010
3. Leonard S. Bobrow, Fundamentals of Electrical Engineering, 2nd Edition, Oxford Press, 1998.

SH 153U ENGINEERING PHYSICS LAB

Teaching Scheme : 02P **Credit:** 01
Evaluation Scheme: 50 ICA **Total Marks:** 50

Course Description:
It is a representative list of practical. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise.
Minimum ten experiments should be performed to cover the entire curriculum of course SH152. The list given below is just a guideline.

Course objectives:
1. To understand the Importance of applications of Applied Physics in daily life
2. To provide students with a basic understanding of the Physics that may be required by engineers in the course of their careers
3. To enhance knowledge related to optics, Fibre Optics, Lasers and its different components to make it suitable for various purposes
4. To introduce the learners to the basics of Quantum Mechanic, acoustics and ultrasonic.
5. To introduce the most important concepts of superconductivity, magnetic materials and fiber optics to the students
6. To provide an insight into the latest topic of research "nanophysics"

Course Outcomes:
Upon successful completion of this course, the students will be able to
1. describe the methodology of science and the relationship between observation and theory.
2. express their knowledge and ideas through oral and written language and following written instruction.
3. teach error propagation and its role in making conclusions.
4. to understand the Importance of applications of Engineering Physics in daily life
5. to provide students with a basic understanding of the Physics that may be required by engineers in the course of their careers

The relevance of PO's and strength of co-relation:

PO	1	2	3	4	5	6	7	8	9	10	11	12
CO1	√											
CO2	√					√						
CO3	√	√										
CO4	√											
CO5	√											
CO6	√											

Course Content

1. Determination of specific charge of an electron (e/m) by Thomson method
2. Determination of wavelength by using diffraction grating.
3. Determination of wavelength of light by using Newton's rings.

4. B-H curve: To draw the B-H curve for the ferromagnetic material and to calculate the hysteresis loss and relative permeability.
5. Study of Sound Level Meter
6. Determine the velocity of the ultrasonic wave in water using Ultrasonic Interferometer
7. Synthesis of nanoparticles and their characterization.
8. To determine the forward and reversed characteristics of a given semiconductor diode.
9. Study the characteristics of the solar cell.
10. Application of Michelson Interferometer
11. To study the photoelectric effect and determine the value of plank's constant
12. Use of polarimeter.
13. Study of the fiber optic communication system.

Guide lines for ICA:

Internal Continuous Assessment should support for regular performance of practical/sheets and its regular assessment with proper understanding principles of practical/ sheets completed.

ME153U ENGINEERING GRAPHICS & DRAFTING LAB

Teaching Scheme: 04PR, **Credit: 02**
Evaluation Scheme: 50 ICA **Total Marks: 50**

Description:
Engineering Graphics Lab is a basic course for all undergraduate Engineering program. This course provides the elementary level knowledge of technical Geometry that is engineering drawing. This course is therefore introduced to provide the basic understanding of the fundamentals of Engineering Drawing, mainly visualization, graphics theory, standards and conventions of drawing, the tools of drawing and the use of Drawings in engineering applications. Course includes in briefs that introduction to Engineering Drawing, Orthographic Projection, Isometric view and Isometric Projection, line planes, solids and Development of solids by plotting on sheets manually and computerized.

Desirable awareness/skills:
Fundamental knowledge of Geometry, elements of Mechanical, Civil and Electrical Engineering.

Course Objectives:
1. Develop the manual drawing skill.
2. Develop drawing interpretation skill.
3. Develop the physical realization of the dimension of the objects.

Course Outcomes:
Upon successful completion of this course, the students will be able to
1. develop imagination of physical objects to be represented on paper for engineering communication by applying principles of Ortho. Projection methods and Isometric projections methods to simple and complex mechanical engineering applications in practice
2. find various dimensional parameters of line, plane, solids etc by drafting .
3. develop the lateral surface of various regular solids in engineering applications.

Relevance of COs /POs and strength of co-relation:

Course Code	COs	POs											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
EG153U	CO 1	-	✓	✓	-	-	-	-	-	-	✓	-	-
	CO 2	-	-	✓	-	-	-	-	-	-	✓	-	✓
	CO 3	-	-	✓	✓	-	-	-	-	-	✓	-	-

Course Content

Internal continuous assessment (ICA) shall be on performances of sheets drawn and based on syllabus of course ME 151.
All ***ten*** sheets are mandatory. Each sheet shall be based and drawn as per below;
Plot and print the following sheets in Group-A by using CAD software on A3- or A-4 size paper,

Internal continuous assessment (ICA) shall be on performances of sheets drawn and based on syllabus of course ME 151. ***Ten*** sheets are mandatory.
Each sheet shall be based and drawn as per below;
Draw any five sheets from following sheets in Group - A on trimmed sheet (hand sketched sheets),

Group - A:

1. Different mechanical parts by (first and third angle) orthographic projections,
2. Draw the Sectional Orthographic Projection (views) of various machine parts by concept of the (single) cutting plane line.
3. Isometric view and projections.
4. Projections of line.
5. Projections of planes
6. Projections of solids
7. Development of surfaces.

Plot any five sheets from following sheets and print the sheets in Group-B by using CAD software on A3- or A-4 size paper,

Group - B*: (minimum 2 Problems for each sheet)*

1. First and third angle orthographic projection method drawings of different mechanical components by the CAD.
2. Orthographic Projections and Sectional Orthographic Projection of different mechanical components by concept of (Single) cutting plane line. All shall be plot by using the CAD.
3. Isometric views examples by the CAD.
4. Isometric projections examples by the CAD.
5. Projections of line examples by the CAD.
6. Projections of Planes examples by the CAD.
7. Development of surfaces examples by the CAD.

Note:-

- Except the basic essential concepts of CAD, most of the teaching part of same shall be conducted concurrently in these laboratory practical hours by exercising different examples.
- Standard sizes of trimmed and untrimmed sheet shall be as per BIS standards SP: 46 (2003).

Guide lines for ICA:

Internal Continuous Assessment should support for regular performance of practical/sheets and its regular assessment with proper understanding principles of practical/ sheets completed.

Text books:

1. Phakatkar. H. G, A text book of Engineering Graphics with an Introduction to Computer Aided Drafting (Vol. I), 7th edition, Nirali Prakashan, Pune 1997.
2. Farazdak Haideri, A text book of Machine Drawing and Computer Graphics, Nirali Prakashan, Pune, 1998.

Reference Books:

1. N. D. Bhatt and V.M. Panchal, Engineering Drawing, Charoter Publications.1999
2. Haravinder Singh, Fundamental of Engineering Drawing and computer Graphics, 3rd edition, Dhanpat Rai Publication Co, New Delhi, India.2001

CE152U ENGINEERING MECHANICS LAB

Teaching Scheme : 02 P, Total:02 **Credit :** 01
Evaluation Scheme :50 ICA **Total marks :**50

Course Description: The laboratories cover experiments related to basic principles of Statics, Dynamics, and solution with computer programs/software's.

Course Objective: To verify the principles of mechanics experimentally and to develop the skill of using graphical methods for the solution of mechanics problems.

Course Outcome:
Upon successful completion of this course, the students will be able to

1. identify when theory applies and when theory is limited by simplifying assumptions
2. identify reasons why actual measurements will differ from theoretical calculations
3. use the laboratory equipment correctly and safely to perform all experiments
4. apply concepts of simple engineering problems using computer programs/software.
5. to study and verify results of shear force and bending moment diagram in simple beam and loadings with software.
6. verify principles of mechanics through experiments.

Relevance of COs /POs and strength of co-relation:

	1	2	3	4	5	6	7	8	9	10	11	12
CO1	√	√		√					√		√	
CO2		√		√					√		√	√
CO3			√				√				√	
CO4			√	√	√				√		√	√
CO5		√			√				√		√	
CO6	√			√					√		√	

Course content

Minimum ten experiments and assignments shall be performed to cover entire curriculum of course CE151U. At least two experiments may be performed using software or program. The list given below is just a guideline.

1. Reaction of Beam.
2. Flat belt Friction.
3. Forces in plane truss – jib crane.
4. Verification of Law of parallelogram of forces.
5. Verification of Law of polygon of forces.
6. Verification of equilibrium equation for spatial forces.
7. Study of Simple machines and verification of Law of Machine (any one).
8. Moment of Inertia of Fly Wheel.
9. Compound Pendulum /Torsion of Pendulum.
10. Analysis of truss using software.
11. Demonstration of concept of - Impact of elastic bodies and coefficient of restitution.
12. Demonstration of concept of - Rolling of various bodies.
13. Study of space force.

14. Graphical work: Graphic station: (Minimum 2) problems of graphical solution of Static, Problems.
15. Graphical work: Graphic Dynamics: (Minimum 1) Problems on Graphical solution of Dynamic role.
16. Study/ Determination of modus of rigidity of material.
17. Determination of modulus of elasticity for mild steel bar.
18. SFD/BMD of simply supported and cantilever beam using software.

SH 151U: INTEGRAL CALCULUS

Teaching Scheme: 03L+01T
Evaluation Scheme: 30MSE +10 ISA +60 ESE **Credit: 04**
Duration of ESE : 03 Hrs. **Total Marks : 100**

Course Description:

This course provides knowledge about basic engineering mathematics to familiarize students with ordinary differential equation and its application, integral calculus, curve tracing and rectification, multiple integrals & its applications, Fourier series

Course Objectives:

Main objective is to give adequate exposure of basics of engineering mathematics so as to enable them to visualize engineering problems by using mathematical tools and to support their subsequent engineering studies.

Course Outcomes:

Upon successful completion of this course the students will be able to

1. understand and apply the theory of first order first degree differential equation to simple electrical circuits, rectilinear motion and orthogonal trajectories.
2. understand and apply special functions like Beta, Gamma and error function and rule of differentiation under integral sign to evaluate some definite integrals.
3. trace and rectify the plane geometric curves manually.
4. evaluate multiple integrals and apply them to find area bounded by plane curves and volume bounded by closed surfaces.
5. understand and apply knowledge of Fourier series to expand the periodic function in a infinite series of sine and cosine terms.

Relevance of PO's and strength of co-relation:

PO	1	2	3	4	5	6	7	8	9	10	11	12
CO1	√	√	√	√								
CO2	√	√		√								
CO3	√	√	√									
CO4	√	√	√	√								
CO5	√	√										

Course Content

Ordinary differential equation and its application: - Definition, classification, solution of differential equation,homogeneous and non-homogeneous differential equation, exact differential equation, linear differential equation, equation reducible to linear (Bernoulli's D. E.) application to orthogonal trajectories, mechanics, electrical circuits, one dimensional conduction of heat.

Integral calculus: - Reduction formulae, gamma function, beta function, differentiation under integral sign, error functions.

Curve tracing and rectification: - Tracing of Cartesian curves, polar curves, and parametric equations, rectification of plane Cartesian and polar curves.

Multiple integrals and its applications: - Double integral, evaluation of double integral by polar co-ordinate, change of order of integration, triple integral, use of spherical and cylindrical co-ordinate, application to surface area and volume of solid revolution, mean and RMS values.

Fourier series: - Dirichlet's conditions, expansion of a function as Fourier series, Fourier series expansion of an even and odd function, change of interval, half range Fourier series expansion application to harmonic analysis.

Text books:

1. P. N. Wartikar and J. N. Wartikar, A text book of Engineering Mathematics (Vol-I and II) 7^{th} edition, Pune Vidhyarthi Griha Prakashan, Pune, 2013.
2. N. P. Bali & Manish Goyal, A text book of Engineering Mathematics 9^{th} edition, Laxmi Prakashan, 2014.

Reference books:

1. Dr. B. S. Grewal, Higher Engineering Mathematics 33^{rd} edition, Khanna Publication, New Delhi, 1996.
2. H. K. Dass Advanced Engineering Mathematics 12^{th} S. Chand Publication, New Delhi, 2003.
3. Erwin Kreyszing, Advanced Engineering Mathematics (8^{th} Edition) Willey Eastern Ltd. Mumbai, 2013.
4. B. V. Ramana, Higher Engineering Mathematics 12^{th} edition, Tata McGraw Hill Publication, New Delhi, 2011.

SH102U: ENGINEERING CHEMISTRY

Teaching Scheme: 03L+00T Credit: 03
Evaluation Scheme: 10 ISA + 30 MSE +60 ESE Total Marks: 100
Duration of ESE: 03Hrs

Course Description:
This course provides knowledge about Applied Chemistry to familiarize students with modern analytical techniques, Lubricants, Corrosion, Polymer Chemistry, Environmental Chemistryand energy science.

Course Outcomes:
The concepts developed in this course will aid in the quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications.
Upon successful completion of this course, the students will be able to

1. Understand chemical behavior, mechanism and application of various lubricants.
2. Understand the synthesis and application of polymers.
3. Understand various energy sources.
4. Understand the general concepts of modern analytical techniques.

Relevance of PO's and strength of co-relation:

	1	2	3	4	5	6	7	8	9	10	11	12
CO1	√											
CO2		√										
CO3							√					
CO4							√					

Course Content

Polymer Chemistry: Classification based on applications, Copolymerization, melting point and glass transition,Viscoelasticity,Synthesis, properties and applications of selected polymers (polyvinyl chloride, polyethylene (HDPE and LDPE), polystyrene polypropylene(PP), polytetrafluroethylene (PTFE/Teflon), epoxy resin, polyvinyl acetate, polycarbonate(PC), Phenol formaldehyde resin. Adhesives, adhesive mechanism and applications. Composites: characteristics, types and applications.Nanocomposites. Metallic and non-metalic fillers.

Environmental Chemistry: Introduction units of hardness, impurities in water and their effects, drinking water or municipal water treatment- removal of microorganisms by adding bleaching powder, chlorination, disinfection by ozone, reverse osmosis. Air, Water and noise pollution.Optimum levels of pollution.Significance and determination of COD and BOD.Solid waste treatment of collection of NKP.Greenhouse effect and global warming .e-waste. Radioactive pollution.

Lubricants: Mechanism of lubrication,classification of lubricants, physical and chemical properties of lubricants with their significance-viscosity, viscosity index flash and fire point, cloud and pour point, oiliness and acid value saponification value and numerical.

Corrosion: Causes and consequences of corrosion, corrosion prevention-cathodic and anodic protection, design and material selection, protective surface coating-hot dipping, cladding, electroplating, powder coating.

Energy Science-

Fuel, Classification of fuel, Analysis of coal, liquid fuels, Petroleum refining, knocking, anti-knock agents, cracking of oils, limitation of fossil fuels. Alternative and non-conventional sources of energy-solar, wind, geo, hydro-power and biomass. Advantages and disadvantages. Nuclear energy, reactors and nuclear waste disposal. Safety measures for nuclear reactors.

Modern analytical techniques

Mass spectrometry. Thermal analysis. Electron microscopy, scanning tunneling microscope and atomic force microscope. Sensors.

Text Books

1. B.S. Chauhan, Engineering Chemistry, 3rd edition, University Science Press, 2009
2. Sunita Rattan, Engineering Chemistry 1stedition, S.K. Katarina and Sons,2012
3. Dara S.S. Engineering Chemistry, S. Chand Publication 10th edition, 2013
4. Shashi Chawla, A Text book of engineering chemistry, Dhanpatrai and Co, 2nd edition 2010
5. P.C. Jain and M. Jain, Engineering Chemistry, Jain and Jain publication, 16th edition, 2015
6. M. Chanda, Advanced polymer chemistry 2nd edition, 2013
7. O.D.Tyagi, M Mehra A Text book of Environmental chemistry, 4th Anmol publication, 2016

Reference Books

1. V. R. Gowarikar, N. V. Vishwanathan, JayadevShridhar, Polymer Science, New Age International Pvt. Ltd., New Delhi, 1997.
2. S. H. Pine Organic Chemistry, 5th Edition, Mcgraw Hill Education, 2010
3. Cotton and Wilkinson,Basic Inorganic Chemistry 4th edition, John Wiley Publication 2011

EE101U- ELEMENTS OF ELECTRICAL ENGINEERING

Teaching Scheme – 02L + 00T **Credits:** 02
Evaluation Scheme: 30 MSE + 10 ISA+60 ESE **Total marks:** 100
Duration of ESE: 3Hrs

Course Description:

Every engineer must have some basic knowledge electrical engineering as (s)he has to work in different engineering fields and to deal with various electric al machines and equipment. This course provides knowledge about basics of electrical engineering to familiarize students with DC and AC machines, electrical wiring material and electrical safety.

Course Objectives:

1. To analyze DC and AC circuits.
2. To apply principles of magnetic circuits.
3. To use single phase and three phase AC supply for electrical machines and equipment.
4. To identify different electrical wiring accessories.
5. To understand importance of electrical safety and protective devices,.

Course Outcomes:

On the successful completion of this course, student shall be able to:

1. analyze DC and AC circuits using Kirchhoff's laws.
2. understand the basics of magnetic circuits.
3. comprehend the working of transformers and rotating machines.
4. understand the use wiring accessories and lamps.
5. practice electrical safety measures.

The relevance of PO's and strength of co-relation:

PO	1	2	3	4	5	6	7	8	9	10	11	12
CO1	√											
CO2	√					√						
CO3	√		√									
CO4	√								√			
CO5	√											

Course Content

D.C. Circuits: Basic electrical quantities, electrical energy and power. Introduction to resistor, inductor and capacitor. Voltage and current sources, Ohm's law, Series and parallel circuits. Fundamental circuit laws: KCL and KVL, Mesh and Nodal analysis.

Single Phase A.C. Circuit: Generation of alternating voltage, sinusoidal voltage and currents, different terminologies associated with AC circuit. Behavior of AC circuit containing pure R, L, and C and Series RL, RC and RLC circuits, Phasor representation in rectangular, polar and exponential forms, impedance and admittance, power in single phase circuit, concept of active, reactive and apparent power and power factor,

Three Phase A.C. Circuits: Generation of three phase AC supply. Threephase star and delta connected balanced circuits, phase and line quantitiesthree phase power.

Magnetic Circuits: Concept of magnetic circuit,BH curves-characteristics of magnetic materials,practical magnetic circuits with dc excitation, magnetically induced voltages-self inductance,magnetic circuits with ac excitation, hysteresis and eddy current losses.

Transformer: Single-phase transformer construction, emf equation, working of ideal transformer, efficiency and regulation by direct loading. Behavior of practicaltransformer on loaded condition.

Electrical Machines: Construction, types,characteristics and applications of DC motors, single phase and three phase induction motors.

Electrical wiring and safety: Switches, Sockets, Switch boards,Lamp Holders, Ceiling rose, Distribution boxes, types of wires and cables, Copper conductor sizes and rating, Earth wires.
Lamps: principle of working of Incandescent lamp, fluorescent lamp, Electronic Choke for fluorescent Tube, CompactFluorescent Lamp, LED lights.
Electrical safety: Electrical safety measures, safety practices, Earthing and its importance, first aid treatment after electrical shock,Fuse, Miniature Circuit Breaker, Earth Leakage Circuit Breaker, Lightning protection.

Text Books :-

1. D. P. Kothari and I. J. Nagrath, Basic Electrical Engineering, Tata McGraw Hill, 2010.
2. E. Huges, Electrical and Electronics Technology, Pearson, 2011

Reference Books:-

1. A.E. Fitzgerald and D.E. Higginbotham, Basic Electrical Engineering, 5th edition, TataMcGraw Hill publication, 2009.
2. S.L.Uppal, Electrical Wiring, Estimating and Costing, 7thedition, Khanna Publishers,1970.
3. Leonard S. Bobrow, Fundamentals of Electrical Engineering, 2nd Edition, Oxford Press,2011.

ET151 BASIC ELECTRONICS AND MEASUREMENT TECHNIQUES

Teaching Scheme: 03L **Credit:** 03
Evaluation Scheme: 30 MSE +10 ISA+60 ESE **Total Marks:** 100
Duration of ESE: 03 Hrs

Course Description:
This course provides knowledge about basic analog electronics components to familiarize students with construction, their working, operation, performance and applications. This course also provides knowledge about measuring instruments and standards. It also gives introduction to recorders, oscilloscopes, errors in measurements. It also covers the active and passive electronic components measuring circuits.

Course Objectives:
1. Familiarize with construction and working basic electronic devices and components and its applications.
2. Familiarize with different measurement techniques.
3. Understand the operation of instruments in the electrical and electronic engineering applications.
4. Gain proficiency in the use of common measuring instruments.

Course Outcomes:

Upon successful completion of this course the students will be able to:
1. analyze the characteristics, testing and controls and applications of basic electronic devices and components
2. understand the concept of measurement system.
3. apply and design analog measuring devices
4. identify, formulate and solve a problem of electrical and electronic measurement.

The relevance of PO's and strength of co-relation:

PO	1	2	3	4	5	6	7	8	9	10	11	12
CO1	√	√										
CO2	√	√										
CO3	√	√										
CO4	√	√										

Course Content

Diode Circuits: p-n junction diode and zener diode. Compare zener diode and general purpose p-n junction diode. Diode as clipper, clamper. Concept of regulated power supply, introduction to DC regulated power supply with its block diagram, characteristics and parameters of regulated power supply. Rectifiers - half, full and bridge wave rectifier, circuit configurations, operation and derivations of rectifier parameters. Filter - necessity, types. Zener shunt regulator- circuit configuration and operation.

Transistor: Basic concept of transistor and working. Transistor configurations (CB, CE and CC), working and V-I characteristics. Compare CB, CE and CC configurations. Alpha, beta and gamma and their relation, transistor biasing – voltage divider bias and fixed bias, its dc load line, transistor as a switch.

Operational Amplifier: Introduction to Op-amp, symbol, block diagram, parameters, ideal Op-amp, inverting, non-inverting and differential configuration using ideal Op-amp. Op-amp applications- adder, subtractor.

Introduction to Communication System: Block diagram of communication system, need of modulation, concept of amplitude and frequency modulation.

Fundamentals of Measurements : Basic block diagram of measurement system, errors, types of errors, significance of electrical measurement system, various electrical effects employed in measuring instruments, static and dynamic characteristics of measuring instruments, classification of measuring instruments, calibration of measuring instrument (potentiometer calibration method), Empirical Measurement.

Measuring Instruments: Introduction to electrical measurements: Classification of analog instruments, Galvanometers and d'Arsonval type. Principle of operation, construction of PMMC, moving iron –extension ranges of ammeters, voltmeters, ohm meter and multi meter, cathode ray oscilloscope and its basic applications.

Transducers: Definition - transducer and sensor, classification of transducers, characteristics and selection criteria, RTD, thermistor, LVDT, potentiometer, strain gauge transducers. Level transducers- resistive, pressure transducer- bourdon tube.

Text Books:

1. Electronic Principles, Albert Malvino, David J Bates, 7th edition, Tata McGraw Hill Education Private Limited, 13th reprint, 2012.
2. Electronic Instrumentation and Measurement Techniques, A. D. Helfrick and W.D. Cooper, Eastern Economy Edition, PHI Learning Pvt. Ltd., New Delhi, 2008.
3. Principle of Communication Systems, H.Taub and D.L.Schilling, 2nd edition, Mc-Graw Hill.

Reference Books:

1. Electronic Devices and Circuit Theory, Robert L Boylestad and Louis Nashelsky, 7th edition.
2. Op-amps and Linear Integrated Circuits, R. A. Gaykwad, 4th edition, PHI, 2008.
3. Instrumentation Measurements and Analysis, B. C. Nakra and K. K. Chaudhry by Tata McGraw Hill Education, 2nd edition, 2004

CO101U PROGRAMMING FOR PROBLEM SOLVING

Teaching Scheme: 03L + 00T **Credit:** 03
Evaluation Scheme: 30 MSE+ 10 ISA + 60 ESE **Total Marks:** 100
Duration of ESE: 03Hrs

Course Description:

This course introduces basic proficiency in programming for solving real life problems.

Desirable awareness/skills:

Basic computer fundamental.

Course Objectives:

The objectives of offering this course are:

1 To impart the basic concepts of programming languages
2 To understand basic concepts about Array, string, pointer, structure and file
3 To write algorithms for solving problems with the help of programming

Course Outcomes:

On the successful completion of this course; student will learn;

CO1	Develop algorithms for mathematical and scientific problems
CO2	Explore alternate algorithmic approaches to problem solving
CO3	Understand the components of computing systems
CO4	Choose data types and structures to solve mathematical and scientific problem
CO5	Develop modular programs using control structures
CO6	Write programs to solve real world problems using procedure oriented features

The relevance of PO's and strength of co-relation:

Course Outcomes ss	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√	√	√	√	√		√	√			√
CO2	√	√	√	√	√	√		√	√			√
CO3	√	√	√	√	√			√	√		√	
CO4	√	√	√	√	√	√		√	√			
CO5	√	√	√	√	√	√			√			
CO6	√	√	√	√	√	√	√	√	√	√	√	√

Course Contents

Introduction to Programming: Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)

Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudo-code with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code

Arithmetic expressions and precedence: arithmetic operators, relational operators, logical operators, assignment operators, increment and decrement operators, conditional operators, bitwise operators, operator precedence

Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching, Iteration and loops

Arrays: Arrays (1-D, 2-D), Character arrays and Strings

Basic Algorithms: Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs

Function: Functions (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference

Recursion: Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc.

Structure: Structures, Defining structures and Array of Structures

Pointers: Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

File handling: defining and opening a file, closing a file, input/output operations on files

Text Books

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. E. Balagurusamy , Programming in ANSI C, 4th edition, Tata McGraw Hill, 2007.
3. Yashavant Kanetkar, Let Us C,10th edition, BPB Publications, 2010.

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. K. R. Venugopal and S. R. Prasad,Mastering C , 1st edition, Tata McGraw Hill, 2011.
3. Stephen G Kochan, Programming in C, 3rd edition, Pearson Education,2004.
4. Ashok N Kamthane, Computer Programming, 2nd edition, Pearson Education, 2008

SH 104 U : COMMUNICTION SKILLS

Teaching Scheme: 01L **Credit: 01**
Evaluation Scheme: 15 MSE + 05 ISA+ 30 ESE **Total marks: 50**
Duration of ESE : 03Hrs

Course Description:

This course provides knowledge about basic engineering physics to familiarize students with communication: An introduction, effective communication, the speech mechanism, identifying common errors in English, vocabulary building, oral communication, basic writing skills, nature and style of sensible writing, written communication.

Course Objectives:

1. To acquaint the students with the basic concepts and techniques of communication that is useful in developing the skills of communicating effectively.
2. To develop positive awareness and interest in language use and the function of each language in our context, this is a multilingual one.
3. To be able to speak and write with correction, fluidity and communicative efficiency in both general and professional environments.
4. Students will increase their written communication skills.
5. Improving fluency through regular practice and speaking drills.
6. Developing a solid understanding of basic grammar structures like noun,verbs, adjectives, etc through class reading and speaking task.

Course Outcomes:

Upon successful completion of this course the students will be able to

1. understand basic concepts and techniques of communication that are useful in developing the skills of communicating effectively.
2. develop positive awareness and interest in language use and the function of each language in our context, which is a multilingual one.
3. demonstrate proper techniques when communicating in writing.
4. improve fluency through regular practice and speaking drills.
5. recognize and describe various communicative styles.

Relevance of PO's and strength of co-relation:

PO	1	2	3	4	5	6	7	8	9	10	11	12
CO1					√				√	√		√
CO2									√	√		√
CO3									√	√		√
CO4					√				√	√		√
CO5									√	√		√

Course Content

Communication: An Introduction: Definition, nature and scope of communication, importance and purpose of communication, process of communication, types of communication, verbal and non-verbal communication.

Effective Communication: Essentials of effective communication, communication techniques, barriers to communication, skills of communication (listening, speaking, reading, and writing)

The Speech Mechanism: A speech event, the production of speech, description of sounds (vowels, consonants).

Identifying Common Errors in English: Subject – verb agreement, noun-pronoun agreement, misplaced modifiers, articles, parts of speech, prepositions

Vocabulary Building: The concept of word formation, types of word formation, use of prefixes and suffixes, synonyms, antonyms and standard abbreviations

Oral Communication: Listening comprehension, pronunciation, intonation, stress and rhythm, common everyday situations: conversations and dialogues, communication at workplace

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

Nature and Style of Sensible Writing: Introduction, definition, classification, providing examples or evidence, writing introduction and conclusion

Written Communication: Essay, précis, resume, story, report, letter writing (formal and informal), notices, comprehension, etc.

Reference Books:

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

SH 105 U : COMMUNICTION SKILLS LAB

Teaching Scheme : 02 PR **Credit: 01**
Evaluation Scheme: 50 ICA **Total marks: 50**
Duration of ESE : 00 Hrs

Course Description:

It is a representative list of practical. The instructor may choose practical as per his requirements (so as to cover entire contents of the course) from the list. Ten practical should be performed to cover entire curriculum of course. The list given below is just a guideline.

Course Outcomes:

After completing this course, Students will able to -

1) use fluency in regular practice
2) use proper techniques when communicating in writing.
3) recognize and describe various communicative styles.
4) apply the basic concepts of communication skills
5) to use different ways of communication in day to day conversations.

Relevance of PO's and strength of co-relation:

PO	1	2	3	4	5	6	7	8	9	10	11	12
CO1					√				√	√		√
CO2									√	√		√
CO3									√	√		√
CO4					√				√	√		√
CO5									√	√		√

Course Content

1. Delivering a seminar or speech on the topic of speech mechanism.
2. To look up words in a dictionary: meaning and pronunciation of words as given in the standard dictionary using symbols of phonetics.
3. Introducing oneself, others and leave taking.
4. Exercises on use of different abbreviations.
5. Exercises on writing sentences on a topic.
6. Resume writing.
7. Greetings for different occasions.
8. Report writing.
9. Observation of recorded seminar or speech delivered by student and suggestions for improvement.
10. Re-arranging jumbled words to make sentence.
11. Correction of errors.

Guide lines for ICA:

Internal continuous assessment should support for regular performance of practical by student and his/her regular assessment with proper understanding practical carried out.

ME 101U MECHANICAL WORKSHOP PRACTICES

Teaching Scheme: 2P, Total: 02 Credit: 01
Evaluation Scheme: ICA: 50 marks Total Marks: 50
Practical hrs: 02 hrs/week

Course Description
The course intends to make students familiar with the basic manufacturing operations that are widely used in day to day life, such as Welding, Fitting, Plumbing, Moulding and Smithy operations.

Desirable awareness/skills:
Fundamental knowledge of Physics, chemistry and mathematics.

Prerequisite
The fundamental knowledge of mathematics, wood working, and Sheet Metals etc.

Course Objectives:
The Student should able to:

1. Learn the fundamental principles of various metal and wood working processes.
2. Understand various operations in welding, Fitting, smithy, foundry and plumbing.
3. Apply the knowledge of these processes in real life applications.
4. Identify the correct methods/ principles of performing the various operations.

Course outcomes:
On successful completion of this course, student shall be able to:

1. To perform arc welding with various joints.
2. To prepare the male and female joint by performing operations like Marking, Cutting, Drilling, Tapping and Filing etc.
3. To analyse various smithy operations.
4. To understand fundamental principles undelaying Foundry and Plumbing.

Relevance of COs /POs and strength of co relation:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	√		√									
CO 2	√	√	√									
CO 3	√		√	√					√			
CO 4			√						√			

Course Content

Students entering in workshop must perform following practical's

1) Welding Shop.
Concept of accidents causes of accidents, safety precautions while working in shop, safety equipment's and their use.
One job on Arc welding- Lap / Butt / Tee Joint etc

2) Fitting Shop.
Study of various tools like- files, drills, taps, dies and Fitting operations.
One job Male/Female fitting with operations- Marking, cutting, drilling, tapping filing etc

3) Black smithy.
Introduction to smithy operations like- bending, forming, upsetting, drawing.
Introduction to smithy tools, hammer, hot and cold chisel, flatters, tongs, anvil etc.
One job in smithy involving upsetting, drawing, bending such as hook, peg, square headed bolt etc.

4) Foundry Shop.
Principles of moulding, methods, core and core boxes, preparation of foundry sand for casting.

5) Plumbing Shop.
Demonstration on plumbing tools, pipes, types of pipe joints, threading dies, Pipe fittings fitments, valves, etc.

Text Books:

1. M.S. Mahajan, Manufacturing Engineering, First edition, Dhanpat Rai and sons, Delhi, 2008
2. Hajara Chaudhary and Bose S K, Element of Workshop Technology, 2nd Edition

Reference Books

1. P N Rao, Production Technology, Volume I and II", Tata McGraw Hill Publication, New Delhi, 2001.
2. P C Sharma, Production Technology, Khanna Publications , 2014
3. R K Jain, Production Technology, Khanna Publication, 2014.
4. W.A.J. Chapman, Workshop Technology, ELBS Low Price Text, Edward Donald Publications. Ltd.
5. Chapman W A J, Production Technology, HMT Tata McGraw Hill Publication,2001.
6. Kannaiah K L, Narayana, Workshop ManualChennai, second Edition Scitech Publications, 1998.

SH103U APPLIED CHEMISTRY LAB

Teaching Scheme: 02P Credit: 01
Evaluation Scheme: 50 ICA Total Marks: 50

Course Description

This course provides knowledge about Applied Chemistry to familiarize students with modern analytical techniques, Lubricants, Corrosion, Polymer Chemistry, Environmental Chemistryand energy science.

Course Outcomes

On successful completion of this course, student shall be able to:

1. Estimate rate constant of reactions from the concentration of reactants/products as a function of time
2. Measure molecular/system properties such as surface tension,viscosity, the conductance of solutions,redoxpotentials, the chloride content of water,etc
3. Synthesize a small drug molecule and analyze a salt sample

Relevance of COs /POs and strength of co relation:

	1	2	3	4	5	6	7	8	9	10	11	12
CO1	√											
CO2		√										
CO3	√											

Course Content

Minimum 10 Experiments shall be performed to cover the entire curriculum of course SH-102U.The list given below is just a guideline.

Group A (Any 5)

1. Determination of surface tension and viscosity coefficient
2. Determination of chloride content of water
3. Synthesis of a polymer
4. Saponification/acid value of an Oil
5. Proximate Analysis of coal
6. Chemical analysis of a salt
7. Adsorption of acetic acid by charcoal

8 .Chemical oscillations-Iodine clock reaction

Group B (Any 5)

1. Determination of hardness of water by using EDTA.
2. Thin layer chromatography
3. Determination of the partition coefficient of a substance between two immiscible liquids
4. Determine the pH of unknown solution
5. Ion exchange column for removal of hardness of water
6. Colligative properties using freezing point depression
7. Synthesis of Drug
8. To determine the alkalinity of given water sample
9. Determination of viscosity of heavy oil by means of Redwood Viscometer.
10. Models of potential energy surfaces

EE102U - ELEMENTS OF ELECTRICAL ENGINEERING LAB

Teaching Scheme – 02 Pr, Total: 02 **Credits:** 01
Evaluation Scheme: 50 ICA **Total marks:** 50
Duration of ESE: 00 ESE

The laboratory work should consist of experiments based on theory syllabus of EE102U. Experiments should involve simulation performance/design of practical, result and conclusion based on it. The sample list given below is just a guide line.

Course Outcomes:

On the successful completion of this course, student shall be able to:

1. get exposure to common electrical components and their ratings.
2. make electrical connections by wires of appropriate ratings.
3. use common electrical measuring instruments.
4. understand the basic characteristics of transformers and electrical machines.
5. practice safety measures.

The relevance of PO's and strength of co-relation:

PO	1	2	3	4	5	6	7	8	9	10	11	12
CO1	√											
CO2						√			√			
CO3			√									
CO4									√			
CO5						√						√

Course Content

1. Study the ratings of real life resistors, inductors and capacitors and their use in different applications.
2. Observation of phase difference between current and voltage for given R-L-C series circuit.
3. Efficiency and regulation of transformer by direct loading.
4. Verification of relationships for star and delta connected three phase load.
5. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor and rotor bars arrangement), synchronous machine (field winding and slip ring arrangement) and single-phase induction machines.
6. Characteristics of self and separately excited dc motors.
7. Internal and external characteristics of dc generators.
8. Introduction and use of AC and DC voltmeter and ammeter, multi-meter, oscilloscope.
9. Study of wirings, switches and various lamps.
10. Study and practice of basic electrical safety measures.

ET152 BASIC ELECTRONICS AND MEASUREMENT TECHNIQUES LAB

Teaching Scheme: 02 PR Total: 02 **Credit:** 01
Evaluation Scheme: 50 ICA **Total Marks:** 50

Course Description

This course provides knowledge about basic analog electronics components to familiarize students with construction, their working, operation, performance and applications. This course also provides knowledge about measuring instruments and standards. It also gives introduction to recorders, oscilloscopes, errors in measurements. It also covers the active and passive electronic components measuring circuits.

Course Objectives

1. Familiarize with construction and working basic electronic devices and components and its applications.
2. Familiarize with different measurement techniques.
3. Understand the operation of instruments in the electrical and electronic engineering applications.
4. Gain proficiency in the use of common measuring instruments.

Course Outcomes

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

1. analyze the characteristics, testing and controls and applications of basic electronic devices and components
2. understand the concept of measurement system.
3. apply and design analog measuring devices
4. identify, formulate and solve a problem of electrical and electronic measurement.

The relevance of PO's and strength of co-relation

PO	1	2	3	4	5	6	7	8	9	10	11	12
CO1	√	√										
CO2	√	√										
CO3	√	√										
CO4	√	√										

Course Content

Minimum ten experiments shall be performed to cover entire curriculum of course ET 151, five from group A and B each. The list given below is just a guideline.

Group A

1. V-I characteristics of p-n junction diode.
2. V-I characteristics of Zener diode.
3. Zener diode as voltage regulator.
4. Half wave and full wave rectifiers and plot its output waveform.
5. Capacitor input filter and plot its output waveform.

6. Transistor input/output characteristics.
7. Transistor as a switch.
8. Inverting and Non-inverting Op-amp.
9. Voltage follower/adder/subtractor using Op-amp.

Group B

10. To identify different meters available in laboratories and write their specification.
11. Study of PMMC Instruments.
12. Temperature measurement using RTD.
13. Displacement measurement using LVDT
14. Design and implementation of series and shunt ohmmeters and evaluate its performance.
15. Measurement of pressure using C type bourdon tube
16. Study of front panel controls of CRO.
17. Measurement using CRO.
18. Component testing using CRO.

CO102U PROGRAMMING FOR PROBLEM SOLVING LAB

Teaching Scheme: 02P, **Credit:** 01
Evaluation Scheme: 50ICA **Total Marks:** 50

Course Description:

This course introduces basic proficiency in programming for solving real life problems.

Desirable awareness/skills:

Basic computer fundamental.

Course Objectives:

The objectives of offering this course are:

1 To impart the basic concepts of programming languages
2 To understand basic concepts about Array, string, pointer, structure and file
3 To write algorithms for solving problems with the help of programming

Course Outcomes:

On the successful completion of this course; student will learn;

CO1	Develop algorithms for mathematical and scientific problems
CO2	Explore alternate algorithmic approaches to problem solving
CO3	Understand the components of computing systems
CO4	Choose data types and structures to solve mathematical and scientific problem
CO5	Develop modular programs using control structures
CO6	Write programs to solve real world problems using procedure oriented features

The relevance of PO's and strength of co-relation

Course Outcomes ss	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	√	√	√	√	√	√		√	√			√
CO2	√	√	√	√	√	√		√	√			√
CO3	√	√	√	√	√			√	√		√	
CO4	√	√	√	√	√	√		√	√			
CO5	√	√	√	√	√	√			√			
CO6	√	√	√	√	√	√	√	√	√	√	√	√

Course Contents

Minimum five experiments from each Group A and Group B shall be performed to cover entire curriculum of course CO101U. The list given below is just a guideline.

GROUP-A

1. **Program for basic arithmetic operations and expressions:** Performing simple arithmetic operations like Addition, Subtraction, Multiplication, and Division.
2. **Find area and volume of geometric objects:** Calculate area and volume of geometric objects (circle, square, triangle etc.)
3. **Finding greatest and smallest of 2 or 3 numbers:** To find smallest and largest numbers
   from given 2 or 3 numbers.
4. **Integer to binary / hex and octal conversion:** To convert integer to binary, hex and octal.
5. **Generating odd / even numbers:** To generate odd and even number**s.**
6. **Greatest/smallest/sum/average of'n' numbers:** To find the greatest/smallest/sum/average of given n numbers using arrays.
7. **Matrix operations:** Performing matrix operation (addition, subtraction, multiplication etc.) using arrays.
8. **Linear / binary search:** To search a number from given n numbers using linear and search.

GROUP-B

1. **Checking a number for palindrome:** Check the given number for palindrome.
2. **Finding GCD of two numbers:** Calculate GCD of any two numbers.
3. **Program to swap two numbers using Call by Reference:** Swapping of two numbers using call by reference
4. **Finding factorial of a number:** Calculate the factorial of any given number.
5. **Checking / generating prime numbers:** Generate the prime numbers.
6. **String processing / operations:** Performing string operations using arrays.
7. **Record processing using structure:** Processing student record using structures.
8. **Simple program for FILES:** Read and write operations

Text Books

1. Byron Gottfried, Schaum's Outline of Programming with C, 3rd edition, McGraw-Hill 2007
2. E. Balagurusamy , Programming in ANSI C, 4th edition, Tata McGraw Hill, 2007.
3. Yashavant Kanetkar, Let us C, 10th edition, BPB Publications, 2010.

Reference Books

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, 2nd edition Prentice Hall of India 1998.
2. K. R. Venugopal and S. R. Prasad, Mastering C, 1st edition, Tata McGraw Hill, 2011.
3. Stephen G Kochan, Programming in C, 3rd edition, Pearson Education, 2004.
4. Ashok N Kamthane, Computer Programming, 2nd edition, Pearson Education, 2008.

SH150AU ENVIRONMENTAL SCIENCE

Mandatory audit course in self learning mode equivalent to study of 3 hrs/week

Course Objectives:

We have tried to achieve the following objectives through this course

1. Creating the awareness about environmental problems among people.
2. Imparting basic knowledge about the environment and its allied problems.
3. Motivating public to participate in environment protection and environment improvement.
4. Developing an attitude of concern for the environment.
5. To help the social group and individuals to acquire knowledge of pollution and environmental degradation.

The relevance of PO's and strength of co-relation

	1	2	3	4	5	6	7	8	9	10	11	12
CO1							√					
CO2						√						
CO3						√						
CO4												√
CO5							√					

Course Contents

The multidisciplinary Nature of Environmental studies-
Definition, scope and importance, Need of public awareness

Natural Resources
Renewable and Non-renewable Resources: Natural resources and associated problems.
(a) Forest resources: use and over-exploitation, deforestation, case studies, timber extraction, mining, dams and their effects on forests and tribal people.
(b) Water resources: use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
(c) Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources
(d) Food resources: world food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity,
(e) Energy resources: growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.
(f) Land resources: land as a resource, land degradation, man induced landslides, soil erosion and desertification.
Role of an individual in conservation of natural resources.

Ecosystem
Concept, structure and function of ecosystem, producers, consumers and decomposers, energy flow in ecosystem ecological succession, food chain, food web and ecological pyramids, types of ecosystem-forest, grassland, desert and aquatic.

Biodiversity and its conservation- Introduction- definition: genetic, species and ecosystem diversity, biogeographical classification of India, India as mega diversity nation, hot spots of

biodiversity, threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts Endangered and endemic species of India. conservation of biodiversity-In-situ and ex-situ conservation of biodiversity

Environmental Pollution and green Chemistry -

Definition, cause, effects and control measures of:-

a. air pollution b. water pollution c. soil pollution d. marine pollution e. noise pollution f. thermal pollution g. nuclear hazards

Role of an individual in prevention of pollution, concept of green chemistry, principles of green chemistry.

Social Issues and the Environment

Water conservation, rain water harvesting, watershed management, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents environmental protection Act. • Air (prevention and control of pollution) Act • Water (prevention and control of pollution) Act • Wildlife Protection Act • Forest Conservation Act

References-

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