KERALA TECHNOLOGICAL UNIVERSITY

B. Tech. Syllabus (Draft)

KERALA TECHNOLOGICAL UNIVERSITY

Proposed Draft of Syllabus
I & II Semester
B. Tech. Degree
2015

as on 17.05.2015

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Course No.	Course Name	L-T-P-Credits	Year of Introduction
MA101	CALCULUS	3-1-0-4	2015

Course Objectives

Students will be able to understand the fundamental concepts and methods in calculus and will be able to apply the same in various engineering and technological applications.

Syllabus

Single Variable Calculus and Infinite series, Three dimensional spaces, Functions of several variables, Calculus of vector valued functions, Multiple integrals, and Vector integration.

Expected outcome

Students shall be able to apply the knowledge of Calculus for solving problems in respective areas of specialization.

Text Book:

1. Anton, Bivens, Davis: Calculus, John Wiley and Sons.

References:

1. Advanced Calculus, Sengar and Singh, Cengage Learning.
2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India edition.
3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi.
4. N. P. Bali, Manish Goyal, Engineering Mathematics, Lakshmy Publications
5. D. W. Jordan, P Smith. Mathematical Techniques, Oxford University Press.
6. A C Srivastava, P K Srivasthava, Engineering Mathematics Vol. 1, PHI Learning Private Limited.

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	Single Variable Calculus and Infinite series (Book I –sec.6.1, 6.4, 6.5, 6.8, 9.3 to 9.9)	3	15 %
	Introduction. Exponential and Logarithmic functions. Graphs and Applications involving exponential and Logarithmic functions. Hyperbolic functions and inverses-derivatives and integrals. Indeterminate forms. Basic ideas of infinite series and convergence.	2	
	Convergence tests-comparison, ratio, root and integral tests (without proof). Geometric series and p-series. Alternating series, conditional and absolute convergence, Leibnitz test. Maclaurins series-Taylor series - radius of convergence. (Sketching, plotting and interpretation of Exponential, Logarithmic and Hyperbolic functions using suitable software. Demonstration of convergence of series by mathematical software)	4	
II	Three dimensional space (Book I –sec.11.1, 11.7, 11.8)	2	15 %
	Rectangular coordinates in three space-graphs in three space, cylindrical surfaces – Quadric surfaces, Traces of surfaces- the quadric surfaces –Technique for	2	
		2	

	graphing quadric surfaces-Translation – reflection –technique for identifying quadric surfaces, cylindrical and spherical coordinates-constant surfaces-converting coordinates-equations of surfaces in cylindrical and spherical coordinates.	2	
FIRST INTERNAL EXAM			
III	Functions of more than one variable (Book I –sec. 13.1 to 13.5 and 13.8) Introduction- Functions of two or more variables – graphs of functions of two variables- level curves and surfaces –graphing functions of two variables using technology, Limits and continuity - Partial derivatives–Partial derivatives of functions of more than two variables - higher order partial derivatives - differentiability, differentials and local linearity -the chain rule – Maxima and Minima of functions of two variables - extreme value theorem (without proof)-relative extrema. (Sketching, plotting and interpretation of functions of two variables, level curves and surfaces using mathematical software)	3 4 3	15 %
IV	Calculus of vector valued functions (Book I-12.1-12.6, 13.6,13.7, 14.9) Introduction to vector valued functions- parametric curves in 3-D space-parametric curves generated with technology –Parametric equations for intersection of surfaces -limits and continuity – derivatives - tangent lines – derivative of dot and cross product-definite integrals of vector valued functions-change of parameter-arc length-unit tangent-normal-binormal-curvature-motion along a curve –velocity-acceleration and speed – Normal and tangential components of acceleration. Directional derivatives and gradients-tangent planes and normal vectors-Lagrange multiplier method – extremum problem with constraint (vector approach).	2 2 2 4	15 %
SECOND INTERNAL EXAM			
V	Multiple integrals (Book I-sec. 14.1, 14.2, 14.3, 14.5, 14.6, 14.7 Double integrals- Evaluation of double integrals – Double integrals in non-rectangular coordinates- reversing the order of integration-area calculated as a double integral- Double integrals in polar coordinates- triple integrals-volume calculated as a triple integral- triple integrals in cylindrical and spherical coordinates- converting triple integrals from rectangular to cylindrical coordinates - converting triple integrals from rectangular to spherical coordinates - change of variables in multiple integrals- Jacobians (applications only).	2 2 2 4	20 %
VI	Vector integration (Book I sec. 15.1, 15.2, 15.3, 15.4, 15.5, 15.7, 15.8) Vector field- graphical representation of vector fields – gradient fields – conservative fields and potential functions – divergence and curl - the ∇ operator - the Laplacian ∇^2, line integrals - work as a line integral- independence of path-conservative vector field - Green's Theorem (without proof- only for simply connected region in plane), surface integrals – Divergence Theorem (without proof) , Stokes' Theorem (without proof)	3 3 4	20 %
END SEMESTER EXAM			

Course No.	Course Name	L-T-P-Credits	Year of Introduction
PH100	ENGINEERING PHYSICS	3-1-0-4	2015

Course Objectives

Most of the engineering disciplines are rooted in Physics. In fact a good engineer is more or less an applied physicist. This course is designed to provide a bridge to the world of technology from the basics of science and to equip the students with skills in scientific inquiry, problem solving, and laboratory techniques.

Syllabus

Harmonic Oscillations: Damped and Forced Harmonic Oscillations. Waves: One Dimensional and Three Dimensional waves, Crystal Structure: Crystal planes and Directions, Miller indices Superconductivity: Properties and Applications, Interference: Interference in thin films (Reflected system) Diffraction: Fraunhofer and Fresnel Diffraction, Grating, Polarization of Light: Double refraction, production and detection of polarized light, Quantum Mechanics: Schrodinger Equations-Formulation and Solution, Operators, Applications. Statistical Mechanics: Microstates and macro states Maxwell- Boltzmann, Bose-Einstein and Fermi Dirac statistics, Planck's Radiation formula, Acoustics: Intensity of sound, Reverberation and design concepts, Ultrasonics: Production, Detection and Applications, NDT methods, Lasers: Properties, Working Principles, Practical Lasers. Photonics: Basics of Solid State lighting, Photo detectors, Solar Cells, Fiber Optics.

Expected outcome

Familiarity with the principles of Physics and its significance in engineering systems and technological advances.

Text Book:

1. Aruldhas. G, Engineering Physics PHI Ltd
2. A Text Book of Engineering Physics, A.S. Vasudeva, S. Chand & Co
3. Applied Physics for Engineers, Neeraj Mehta, PHI Ltd

References:

1. Engineering Physics, Premlet.B, Mc GrawHill India Ltd
2. Engineering Physics, B.K. Pandey, S. Chathurvedi, Cengage Learning
3. Engineering Physics , Bhattacharya and Tandon , Oxford India
4. Concepts of Modern Physics, Arthur Beiser, 6e, McGrawHill India Ltd
5. Optics , Eugene Hecht, 4e, Pearson Education
6. A text book of Optics , Brijlal and Subramanyam, 4e, S.Chand
7. Fiber Optic Communications , Joseph C Palais, 4e, Pearson Education
8. University Physics , Sears and Zemansky, 13e, Pearson

Web:

www.physics.org, www.howstuffworks.com, www.physics.about.com

Course Plan			
Module	**Contents**	**Hours**	**Sem. Exam Marks**
I	**Oscillations and Waves** **Harmonic Oscillations**: Differential equation of damped harmonic oscillation, forced harmonic oscillation and their solutions- Resonance, Q factor, Sharpness of resonance- LCR circuit as an electrical analogue of Mechanical Oscillator (Qualitative) **Waves**: One dimensional wave- differential equation and solution. Three dimensional waves – Differential equation & its solution. Transverse vibrations of a stretched string.	5 4	15
II	**Crystal Structure, Superconductors** **Crystal Structure**: Space lattice-Unit cell and lattice parameters-Directions and Planes in crystals- Miller indices- Interplanar spacing in terms of Miller indices. Braggs law- X-ray diffraction **Superconductivity**: Superconducting phenomena. Meissner effect. Type-I and Type-II superconductors. BCS theory (qualitative). High temperature superconductors.- Josephson Junction – SQUID- Applications of superconductors.	4 5	15
FIRST INTERNAL EXAM			
III	**Physical Optics** **Interference**: Coherence. Interference in thin films and wedge shaped films (Reflected system) Newton's rings-measurement of wavelength and refractive index of liquid Interference filters. Antireflection coating. **Diffraction**: Fresnel and Fraunhofer diffraction. Fraunhofer diffraction at a single slit. Plane transmission grating. Grating equation-measurement of wavelength. Rayleigh's criterion for resolution. Resolving power and dispersive power of grating. **Polarization of Light**: Types of polarized light. Double refraction. Nicol Prism. Quarter wave plate and half wave plate. Production and detection of circularly and elliptically polarized light. Laurent's Half shade Polarimeter- Kerr Cell - Polaroids & applications.	3 3 3	15
IV	**Introduction to Quantum Mechanics and Statistical Mechanics** **Quantum Mechanics**: Uncertainty principle and its applications- formulation of Time dependent and Time independent Schrödinger equations- physical meaning of wave function- Energy and momentum Operators-Eigen values and functions- Expectation values- One dimensional infinite square well potential .Quantum mechanical Tunnelling (Qualitative) **Statistical Mechanics**: Macro states and Microstates. Phase space. Basic postulates of Maxwell- Boltzmann, Bose-Einstein and Fermi Dirac statistics.	5	15

	Distribution equations in the three cases (no derivation). Density of states. Derivation of Planck's radiation formula. Free electrons in a metal as a Fermi gas. Fermi energy.	4	
SECOND INTERNAL EXAM			
V	**Acoustics and Ultrasonics** **Acoustics**: Intensity of sound- Loudness-Absorption coefficient - Reverberation and reverberation time - Significance of reverberation time-Sabine's formula (No derivation) - Factors affecting acoustics of a building. **Ultrasonics**: Production of ultrasonic waves- Magnetostriction effect and Piezoelectric effect- Piezoelectric oscillator - Detection of ultrasonics - Thermal and piezoelectric methods - Applications of ultrasonics - NDT and medical.	4 4	20
VI	**Lasers and Photonics** **Laser**: Properties of Lasers, Absorption, Spontaneous and stimulated emissions, Population inversion, Einstein's coefficients, Working principle of laser, Optical resonant cavity. Ruby Laser, Helium-Neon Laser, Semiconductor Laser (qualitative). Applications of laser, holography (Recording and reconstruction) **Photonics**: Basics of solid state lighting- LED -Photo detectors- photo voltaic cell, junction & avalanche photo diodes, photo transistors, Thermal detectors, Solar cells- I-V characteristics –Optic fibre-Principle of propagation-numerical aperture-optic communication system (block diagram) -Industrial, medical and technological applications of optical fibre. Fibre optic sensors - Intensity modulated, phase modulated and polarization modulated sensors.	5 5	20
END SEMESTER EXAM			

Course No.	Course Name	L-T-P-Credits	Year of Introduction
CY100	ENGINEERING CHEMISTRY	3-1-0-4	2015

Course Objectives

To enable the students to acquire knowledge in the concepts of chemistry for engineering applications and to familiarize the students with different application oriented topics like new generation engineering materials, storage devices, different instrumental methods etc. and to develop abilities and skills that are relevant to the study and practice of chemistry.

Syllabus

Spectroscopy - Principles and Applications, Electrochemistry - Electrodes, Electrochemical series and applications, Nernst Equation, Potentiometric titration and application, Cells, Instrumental Methods- Thermal Analysis, Chromatography; Conductivity, Chemistry of Engineering Materials, Copolymers, Conducting Polymers, Advanced Polymers, Nanomaterials, Fuels and Calorific value; Lubricants and their properties, Water Technology - Hardness, Water softening methods, Sewage water Treatment.

Expected outcome

The student will be able to apply the knowledge of chemistry and will be equipped to take up chemistry related topics as part of their project works during higher semester of the course.

Text Books:

1. Engineering Chemistry (ISBN-9788126519880) - Wiley India
2. Jain and Jain, Engineering Chemistry, Dhanpat Rai Publishers

References Books:

1. Engineering Chemistry, Shashi Chawla, Dhanpat Rai Publishers
2. Engineering Chemistry, Dara and Dara, S Chand Publishers
3. Chemistry of Engineering Materials - C P Murthy, C V Agarwal & A Naidu - BS Publications
4. Engineering Chemistry - M M Lippal & SC Bhatia, Khanna Publishers
5. Seymour RB. Introduction to Polymer Chemistry, Mc Graw Hill
6. Engineering Chemistry, Sesha Maheswaramma, Pearson (ISBN 9788131774519)

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	**Spectroscopy**: Introduction, Beer Lamberts Law (problems to be worked out), UV-visible spectroscopy – Principle, Instrumentation and applications; IR spectroscopy – Principle and applications; ^{1}H NMR spectroscopy – Principle, chemical shift – spin-spin splitting and applications including MRI.	 1 2 2 4	15
II	**Electrochemistry** Types of electrodes - SHE, Calomel electrode, Glass electrode,	 2	15

	Electrochemical series and its applications including Decomposition potential and Overvoltage, Nernst equation- Derivation and application Potentiometric titration – Acid-base and redox titration, Lithium ion cell and Fuel cell.	2 1 2 1	
	FIRST INTERNAL EXAM		
III	**Instrumental Methods** Thermal analysis-Principle, instrumentation and applications of TGA and DTA. Chromatographic methods - Basic principles, column, TLC. Instrumentation and principles of GC and HPLC. Conductivity - Measurement of conductivity	 3 4 1	15
IV	**Chemistry of Engineering Materials** Copolymers - BS, ABS - Structure and Properties. Conducting Polymers - Polyaniline, Polypyrrole - Preparation, Structure and Properties. OLED – Preparation, Structure and Properties. Advanced Polymers – Kevlar, Polybutadiene rubber and silicone rubber.– Preparation, Structure and Properties. Nanomaterials – Definition, Classification, Chemical methods of preparation (Any 2 methods), Properties and Applications – Carbon Nano Tubes and fullerenes.	 1 2 1 2 2 1	15
	SECOND INTERNAL EXAM		
V	**Fuels and Lubricants** Fuels - Calorific Value, HCV and LCV - Determination of calorific value of a solid and liquid fuel by Bomb calorimeter - Dulongs formula and Numericals. Liquid fuel - Petrol and Diesel - Octane number & Cetane number - Biodiesel - Natural gas. Lubricant - Introduction, solid, semisolid and liquid lubricants. Properties of lubricants - Viscosity Index, Flash point, Fire point, Cloud point, Pour point and Aniline point.	 3 1 2 1 2	20
VI	**Water Technology** Types of hardness, Estimation of Hardness - EDTA method, Water softening methods - Ion exchange process - Principle. Polymer ion exchange - Reverse Osmosis - Disinfection method by chlorination and UV Dissolved oxygen, BOD and COD. Sewage water Treatment - Trickling Filter and UASB process.	 1 4 2 2	20
	END SEMESTER EXAM		

Course No.	Course Name	L-T-P-Credits	Year of Introduction
BE100	ENGINEERING MECHANICS	3-1-0-4	2015

Course Objectives

1. To apply the principles of mechanics to practical engineering problems.
2. To identify appropriate structural system for studying a given problem and isolate it from its environment.
3. To develop simple mathematical model for engineering problems and carry out static analysis.
4. To carry out kinematic and kinetic analyses for particles and systems of particles.

Syllabus

Statics: Fundamental concepts and laws of mechanics; Force systems; Principle of moments; Resultant of force and couple systems; Equilibrium of rigid body; Free body diagram; Equilibrium of a rigid body in three dimension; Support reactions; Properties of surfaces and solids - Centroid, Moment of inertia, Polar moment of inertia, Mass moment of inertia, Product of inertia and Principal moment of inertia; Theorems of Pappus – Guldinus; Friction; Principle of virtual work.

Dynamics: Rectangular and cylindrical coordinate system; Combined motion of rotation and translation; Newton's second law in rectilinear translation; D'Alembert's principle; Mechanical vibration; Simple harmonic motion; Spring-mass model.

Expected outcome

1. Students will be able to apply and demonstrate the concepts of mechanics to practical engineering problems.
2. Students will be able to determine the properties of planes and solids.
3. Students will be able to apply fundamental concepts of dynamics to practical problems.

Text Books:

1. Shames I. H., Engineering Mechanics - Statics and Dynamics, Pearson Prentice
2. Timoshenko S. & Young D. H., Engineering Mechanics, Mc-Graw Hill

References Books:

1. Beer and Johnson, Vector Mechanics for Engineers - Statics and Dynamics, Tata Mc-Graw Hill Publishing Company Limited
2. Hibbeler R.C., Engineering Mechanics: Statics and Dynamics. Pearson Prentice Hall
3. Benjamin J., Engineering Mechanics, Pentex Book Publishers and Distributors
4. Kumar K. L., Engineering Mechanics, Tata Mc-Graw Hill Publishing Company Limited
5. Tayal A. K., Engineering Mechanics- Statics and Dynamics, Umesh Publications
6. S.S.Bhavikkatti, Engineering Mechanics, New Age International Publishers
7. Jaget Babu, Engineering Mechanics, Pearson Prentice Hall
8. Merriam J. L. and Kraige L. G., Engineering Mechanics – Vol. I and II, John Wiley.

9. Rajasekaran S. and G. Sankarasubramanian, Engineering Mechanics, Vikas Publishing House Private Limited			
Course Plan			
Module	**Contents**	**Hours**	**Sem. Exam Marks**
I	Statics: Fundamental concepts and laws of mechanics – Rigid body – Principle of transmissibility of forces	2	**15**
	Coplanar force systems - Moment of a force – Principle of moments	2	
	Resultant of force and couple system	4	
	Equilibrium of rigid body – Free body diagram – Conditions of equilibrium in two dimensions – Two force and three force members.	3	
II	Types of supports – Problems involving point loads and uniformly distributed loads only.	5	**15**
	Force systems in space – Degrees of freedom – Free body diagram – Equations of equilibrium – Simple resultant and Equilibrium problems.	4	
FIRST INTERNAL EXAM			
III	Properties of planar surfaces – Centroid and second moment of area (Derivations not required) - Parallel and perpendicular axis theorem – Centroid and Moment of Inertia of composite area.	3	**15**
	Polar Moment of Inertia – Radius of gyration – Mass moment of inertia of cylinder and thin disc (No derivations required).	2	
	Product of inertia – Principal Moment of Inertia (conceptual level).	3	
	Theorems of Pappus and Guldinus.	1	
IV	Friction – Characteristics of dry friction – Problems involving friction of ladder, wedges and connected bodies.	6	**15**
	Definition of work and virtual work – Principle of virtual work for a system of connection bodies – Problems on determinate beams only.	4	
SECOND INTERNAL EXAM			
V	Dynamics: Rectangular and Cylindrical co-ordinate system	1	**20**
	Combined motion of rotation and translation – Concept of instantaneous centre – Motion of connecting rod of piston and crank of a reciprocating pump.	4	
	Rectilinear translation – Newton's second law – D'Alembert's Principle – Application to connected bodies (Problems on motion of lift only).	4	
VI	Mechanical vibrations – Free and forced vibration - Degree of freedom.	1	**20**
	Simple harmonic motion – Spring-mass model – Period – Stiffness – Frequency – Simple numerical problems of single degree of freedom.	7	
END SEMESTER EXAM			

Course No.	Course Name	L-T-P-Credits	Year of Introduction
BE110	ENGINEERING GRAPHICS	1-1-2-3	2015

Course Objectives

To enable the student to be able to effectively communicate basic designs through graphical representations as per standards.

Syllabus

Introduction to Engineering Graphics; Construction of Conic sections and special curves; Orthographic projections of points and lines; Traces of lines; Orthographic projections of solids. Sections of solids; Development of Surfaces; Intersection of surfaces; Isometric Projections; Perspective projections; Introduction to computer aided drafting.

Expected outcome

Upon successful completion of this course, the student would have accomplished the following abilities and skills:

1. Fundamental Engineering Drawing Standards.
2. Dimensioning and preparation of neat drawings and drawing sheets.
3. Interpretation of engineering drawings
4. The features of CADD software

Text Books:

1. Engineering Graphics - P. I. Varghese, V I P Publishers
2. Engineering Graphics - J Benjamin, Pentex Publishers

References Books:

1. Engineering Drawing - N D Bhatt, Charotar Publishing House Pvt Ltd.
2. Engineering Drawing & Graphics - Venugopal K, New age International Publishers
3. Engineering Graphics - John K C, Prentice Hall India Pubilshers
4. Engineering Graphics - Anil Kumar K. N., Adhyuth Narayan Publishers
5. Engineering Drawing - Basant Agrawal & C M Agrawal, Tata McGraw Hill Publishers

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	Minimum 1 sheet Introduction to Engineering Graphics: Drawing instruments; BIS code of practice for general engineering drawing; Construction of Conic sections by eccentricity method; Construction of Cycloids, Involutes, Spirals and Helix.	6	15
II	Minimum 2 sheets Orthographic projections of points and lines:-Projections of points in different quadrants; Projections of straight lines inclined to one or both of	10	15

	the reference planes; True length and inclination of lines with reference planes; Traces of lines.		
FIRST INTERNAL EXAM			
III	Minimum 2 sheets Orthographic projections of solids:-Projections of simple solids* in simple positions, axis inclined to one of the reference planes and axis inclined to both the reference planes-use change of position method OR auxiliary projection method.	10	15
IV	Minimum 2 sheets Sections of solids:-Sections of simple solids* in simple vertical positions with section plane perpendicular/inclined to one of the reference planes – True shapes of sections.	8	15
SECOND INTERNAL EXAM			
V	Minimum 2 sheets Development of surfaces of simple solids and cut regular solids; Intersection of surfaces:-Intersection of prism in prism & cylinder in cylinder- axis bisecting at right angles only.	10	20
VI	Minimum 2 sheets Isometric Projections:-Isometric projections and views of simple and truncated simple solids, sphere, hemisphere and their combinations in simple position. Conversion of Pictorial views to Orthographic views by free hand sketching.	3	20
	Introduction to Computer Aided Drafting - Preparation of engineering drawings by using any software capable of drafting and modeling. (For internal work assessment only, not for University Examination)	9	
Notes 1. All drawing exercises mentioned above are for class work in A2 size drawing sheets. Additional exercises wherever necessary may be given as home assignments. 2. First angle projection to be followed.			
END SEMESTER EXAM			

Course No.	Course Name	L-T-P-Credits	Year of Introduction
BE101-01	INTRODUCTION TO CIVIL ENGINEERING	2-1-0-3	2015

Course Objectives

1. To provide the students an overview of the profession of Civil Engineering.
2. To give the students an illustration of the use and properties of various building materials and explain the building construction aspects.

Syllabus

Civil Engineering as a profession; General introduction to history of Civil Engineering; types and classification of buildings; setting out of a building; Building materials - Stones, Bricks, Tiles, Cement, Aggregate, Cement mortar, Timber, Steel; Building Construction - Stone Masonry, Brick Masonry, Floors and flooring, Roofs and roof coverings.

Expected outcome

1. Students will be able to explain the importance of Civil Engineering in the infrastructural development of the society.
2. They will be able to illustrate the types, uses and properties of various building materials.
3. Students will be able to explain the method of construction of different components of a building.

Text Books:

1. Satheesh Gopi, Basic Civil Engineering, Pearson Publishers
2. Ketki Rangwala Dalal, Essentials of Civil Engineering, Charotar Publishing House

References Books:

1. Anurag A. Kandya, Elements of Civil Engineering, Charotar Publishing house
2. Rangwala S C and Ketki B Dalal, Engineering Materials, Charotar Publishing house
3. Rangwala S C and Ketki B Dalal, Building Construction, Charotar Publishing house
4. Michael S Mamlouk and John P Zaniewski, Materials for Civil and Construction Engineering, Pearson Publishers.
5. McKay, W. B. and McKay, J. K., Building Construction Volumes 1 to 4, Person India Education Services
6. W. F. Chen and J. Y. Richard Liew (Eds.), The Civil Engineering Handbook, Second Edition, CRC Press (Taylor and Francis)

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	General introduction to Civil Engineering – History of Civil Engineering - Relevance of Civil Engineering in the overall infrastructural development of the country.	2	15

	Types and classification of structures – buildings, towers, chimneys, bridges, dams, retaining walls, water tanks, silos, roads, railways, runways and pipelines (Brief description only)	3	
	Definition and types of buildings as per National Building Code of India (brief description only).	1	
	Selection of site – Components of a building and their functions – Setting out of a building.	2	
II	Stones: Classification of stones – Qualities of good building stones – Quarrying – Dressing – Tests – Specifications – Uses of common building stones.	2	15
	Bricks: Composition of good brick earth – Classification – Qualities of good bricks – Field and laboratory tests – Specifications.	2	
	Tiles: Classification – Manufacture – Properties – Tests – Specifications	3	
FIRST INTERNAL EXAM			
III	Cement: Basic Ingredients – Manufacturing process – Grades – Properties – Tests – Specifications.	4	15
	Aggregates: Fine and coarse aggregate – Properties – Uses – Tests.	3	
	Cement Mortar: Types and preparation.	1	
IV	Stone Masonry: Types – Details of Ashlar, Random Rubble, Coarse Rubble and Dry Rubble Masonry.	3	15
	Brick Masonry: Types – Bond – Introduction to all types of bonds – English bond in detail (1, 1½ and 2 brick walls) – Comparison of stone and brick masonry.	4	
SECOND INTERNAL EXAM			
V	Timber: Properties – Uses – Classification – Seasoning – Defects – Preservation – Tests; Hard board and Particle board – Manufacture and use.	3	20
	Steel: Structural steel and steel as reinforcement – Types – Properties – Uses – Market forms.	3	
VI	Floors and Flooring materials: Different types and selection of floors and floor coverings.	3	20
	Roofs and roof coverings: Different types of roofs – Suitability – Types and selection of roofing materials.	3	
END SEMESTER EXAM			

Course No.	Course Name	L-T-P-Credits	Year of Introduction
BE101-02	INTRODUCTION TO MECHANICAL ENGINEERING SCIENCES	2-1-0-3	2015

Course Objectives

1. To introduce different disciplines of Mechanical Engineering
2. To kindle interest in Mechanical Engineering
3. To impart basic mechanical engineering principles

Syllabus

Thermodynamics & Power sources, Thermal Engineering, Refrigeration and Air Conditioning, Automobile & Aeronautical Engineering, Mechanisms & Machines, Materials and manufacturing.

Expected outcome

At the end of the course, the students will have exposed to the different areas of Mechanical Engineering; gained idea about nature, scope and applications of Mechanical Engineering principles.

References Books:

1. Landmarks in Mechanical Engineering- Rachel Maines, ASME
2. Engineering Thermodynamics – Spalding & Cole, ELBS & Edward Arnold (Pub) Ltd.
3. Thermodynamics- J P Holman, McGraw Hill Co.
4. Principles of Turbomachinery- William W Peng, John Wiley & Sons
5. Internal Combustion Engine Fundamentals- John Heywood, McGraw Hill Publishers
6. Principles of Refrigeration- Roy J Dossat, PHI
7. Air Conditioning Principles & Systems- Edward G Pita, PHI
8. Automobile Engg- K K Jain & R B Asthana, TTTI Bhopal
9. Automotive Engg Fundamentals- Richard Stone and Teffrey K Ball, SAE International
10. Aerodynamics, Theodore Von Karman
11. Theory of Machines & Mechanisms- J E Shigley & John Joseph Uicker, Mc Graw Hill Publishers
12. Mechanical Engg Design- J E Shigley, Mc Graw Hill Publishers
13. Manufacturing Processes for Engineering Materials- Serope Kalpakjian & Steven R Schmid, Pearson education
14. Rocket Propulsion Elements- G P Sutton & D M Ross, John Wiley & Sons
15. The Development of Science & Technology; Notes by R V G Menon
16. Online course on Refrigeration & Air conditioning, IIT Kharagpur www.nptel.ac.in

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	**Thermodynamics**: Nature and scope of thermodynamics; Basic concepts ; Laws of thermodynamics- Discovery, Significance & Applications; Qualitative ideas on Entropy, Available energy, Irreversibility, Clausius	7	15

	Inequality, Principle of increase of entropy & Carnot engine; Limitations of Thermodynamics; Sources of power; history of power production; power production in the future.		
II	**Thermal Engineering:** Historical development of steam engine, steam turbines, gas turbines and hydraulic turbines; Principle of turbomachinery; History of IC engines; two stroke and four stroke engines-working, applications; Air compressors- types and uses; Principles of Rocket propulsion, chemical rockets, Indian space programme	7	15
FIRST INTERNAL EXAM			
III	**Refrigeration & Air Conditioning:** History & scope of refrigeration; applications of refrigeration; Food preservation, refrigerated storage; applications in chemical and process industries; special applications; Air conditioning- Principles & systems; scope of air conditioning; Components of A/c systems, all-air and all-water A/c systems;, Psychrometric properties of air; Human comfort; comfort standards.	7	15
IV	**Automobile & Aeronautical Engineering**: Introduction to an Automobile; history of the automobile; Indian Automobiles; Types of automobiles; Layout of an automobile; Major components and their functions; Manufacturers of motor vehicles in India; Fundamentals of aerodynamics; theory of lift and drag; aircraft engines-types and applications.	7	15
SECOND INTERNAL EXAM			
V	**Mechanisms & Machines:** Introduction; Analysis and synthesis; terminology; definitions & assumptions; planar, spherical and spatial mechanisms, examples of mechanisms; mobility; classification of mechanisms; Grashof's law; mechanical advantage; Mechanical Engineering design; types of design; design considerations; types of loads; factor of safety; codes & standards; economics of design; reliability; safety.	7	20
VI	**Manufacturing Engineering & Materials:** Introduction and history of materials and manufacturing; engineering materials; metals, alloys, composites, microstructures, heat treatment, physical properties of materials and material testing; methods of manufacturing; examples of manufactured products; Computer Integrated manufacturing; lean production & agile manufacturing; environmentally conscious design & manufacturing; organization for manufacture.	7	20
END SEMESTER EXAM			

Course No.	Course Name	L-T-P-Credits	Year of Introduction
BE101-03	INTRODUCTION TO ELECTRICAL ENGINEERING	2-1-0-3	2015

Course Objectives

The objective of this course is to set a firm and solid foundation in Electrical Engineering with strong analytical skills and conceptual understanding of basic laws and analysis methods in electrical and magnetic circuits.

Syllabus

Fundamental Concepts of Circuit Elements and Circuit variables, Electromagnetic Induction, Real and Ideal independent voltage and current sources, V-I relations; Basic Circuit Laws, Analysis of resistive circuits, Magnetic Circuits; Alternating current fundamentals, Phasor Concepts, Complex representation, Phasor analysis of RL, RC, RLC circuit, admittances; Complex Power, Resonance in series and parallel circuits; Three-phase systems, analysis of balanced and unbalanced star and delta connected loads; Wiring systems, Earthing, Protective devices.

Expected outcome

The course will enable students to learn advanced topics in Electrical Engineering.

Text Books:

1. Suresh Kumar K. S, Electric Circuits and Networks, Pearson Education.
2. S.K. Bhattachariya, Basic Electrical & Electronics Engineering, Pearson
3. Sudhakar and Syam Mohan, Circuits and Networks Analysis and Synthesis, Tata McGraw Hill

References Books:

1. Hughes, Electrical and Electronic Technology, Pearson Education
2. Joseph Edminister, Electric Circuits, Schaum's Outline Series, Tata McGraw Hill
3. John Bird, Electrical Circuit Theory and Technology, Routledge, Taylor & Francis Group
4. Parker and Smith, Problems in Electrical Engineering, CBS Publishers and Distributors
5. Hayt W. H., J. E. Kemmerly and S. M. Durbin Engineering Circuit Analysis, Tata McGraw Hill,

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	Fundamental Concepts of Circuit Elements and Circuit variables: Electromotive force, potential and voltage. Resistors, Capacitors, Inductors- terminal V-I relations. Electromagnetic Induction – Faraday's laws, Lenz's law, statically and dynamically induced emf, self and mutual inductance, coupling coefficient. Real and Ideal independent voltage and current sources, V-I relations. Passive sign convention. Numerical problems.	6	15
II	Basic Circuit Laws: Kirchhoff's current and voltage laws, analysis of resistive circuits - mesh, node analysis, super mesh and super node	9	15

	analysis. Star delta transformation. Magnetic Circuits: Magneto motive force, flux, reluctance, permeability-comparison of electric and magnetic circuits analysis of series and parallel magnetic circuits, magnetic circuits with air-gaps. Numerical problems.		
FIRST INTERNAL EXAM			
III	Alternating current fundamentals: Frequency, Period, RMS and average values, peak factor and form factor of periodic waveforms (pure sinusoidal and composite waveforms). Phasor Concepts, Complex representation (exponential, polar and rectangular forms) of sinusoidal voltages and currents, phasor diagrams, Complex impedance - series and parallel impedances and admittances. Phasor analysis of RL, RC, RLC circuits. Numerical problems.	9	**15**
IV	Complex Power: Concept of power factor - active, reactive power and apparent power. Resonance in series and parallel circuits: Energy, bandwidth and quality factor, variation of impedance and admittance in series and parallel resonant circuits. Numerical problems.	6	**15**
SECOND INTERNAL EXAM			
V	Three-phase systems: Star and delta connections, three-phase three wire and three-phase four-wire systems, analysis of balanced and unbalanced star and delta connected loads, power in three-phase circuits. Numerical problems.	6	**20**
VI	Wiring systems: Basic concepts of wiring (conduit wiring only), service mains, meter board and distribution board. Earthing: Earthing of installations - necessity of earthing, plate & pipe earthing. Protective devices: protective fuses, MCB, ELCB.	6	**20**
END SEMESTER EXAM			

Course No.	Course Name	L-T-P-Credits	Year of Introduction
BE101-04	INTRODUCTION TO ELECTRONICS ENGINEERING	2-1-0-3	2015

Course Objectives

1. To get basic idea about types, specification and common values of passive components
2. To familiarize the working and characteristics of diodes, transistors and MOSFETS
3. To understand working of diodes in circuits and in rectifiers
4. To familiarize some measuring instruments

Syllabus

Evolution and Impact of Electronics, Familiarization of Resistors, Capacitors, Inductors, Transformers and Electro mechanical components, Semiconductors, PN junction diode, Zener diode, LED, photo diode, Bipolar Junction Transistors: Structure, principle of operation, different configurations, load line and operating point, biasing and stabilization, Transistor as amplifier, switch, Junction Field Effect Transistors: Structure, principle of operation, characteristics MOSFET: Structure, principle of operation, characteristics, Principle of operation of Photo transistor, UJT, SCR, Diode circuits and power supplies: Series and parallel diode circuits, Half-wave & full wave rectifiers, capacitor filter, zener voltage regulator, Electronic Measurements and measuring Instruments: Performance parameters, Analog and digital multimeter, CRO, DSO, function generator, Testing of Electronic components.

Expected outcome

Student can identify the active and passive electronic components and can design and setup simple circuits using diodes and transistors. Voltage and currents can be measured and monitored using electronic measuring instruments

Text Books:

1. Jacob Millman, Christos Halkias, Chetan D Parikhu, Integrated Electronics, Tata Mc Graw Hill
2. Robert L. Boylested, Louis Nashelsky, Electronic Devices and Circuit Theory, Pearson Education

References Books:

1. David A Bell, Electronic Devices and Circuits, Oxford University Press
2. A.S. Sedra, Kenneth C. Smith, Microelectronic Circuits, Oxford University Press
3. Santiram Kal, Basic Electronics: Devices, Circuits and its fundamentals, PHI Learning
4. Donald A Neaman, Electronic Circuits Analysis and Design, Mc Graw Hill

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	Evolution of Electronics, Impact of Electronics in industry and in society.	1	15
	Resistors, Capacitors: types, specifications. Standard values, marking,	3	

	colour coding.		
	Inductors and Transformers: types, specifications, Principle of working.	2	
	Electro mechanical components: relays and contactors.	1	
II	Diodes: Intrinsic and extrinsic semiconductors, PN junction diode, barrier potential, V-I characteristics, Effect of temperature. Equivalent circuit of a diode. Piece wise linear model.	3	15
	Specification parameters of diodes and numbering.	1	
	Zener diode, Varactor diodes, characteristics, working principle of LED, photo diode, solar cell.	3	
FIRST INTERNAL EXAM			
III	Bipolar Junction Transistors: Structure, typical doping, Principle of operation, concept of different configurations. Detailed study of input and output characteristics of common base and common emitter configuration, current gain, comparison of three configurations.	3	15
	Concept of load line and operating point. Need for biasing and stabilization, voltage divider biasing, Transistor as amplifier, switch, RC coupled amplifier and frequency response	3	
	Specification parameters of transistors and type numbering	1	
IV	Junction Field Effect Transistors: Structure, principle of operation, characteristics, comparison with BJT.	2	15
	MOSFET: Structure, principle of operation of Enhancement type MOSFET, Current voltage characteristics, Depletion-type MOSFET.	2	
	Principle of operation of Photo transistor, UJT, SCR.	3	
SECOND INTERNAL EXAM			
V	Diode circuits and power supplies: Series and parallel diode circuits, Clippers, Clampers, Voltage multipliers	3	20
	Half-wave and full wave (including bridge) rectifiers, Derivation of V_{rms}, V_{dc}, ripple factor, peak inverse voltage, rectification efficiency in each case, capacitor filter, working and design of a simple zener voltage regulator. Block diagram description of a DC Power supply, Principle of SMPS	4	
VI	Electronic Measurements and measuring Instruments.	2	20
	Generalized performance parameters of instruments: error, accuracy, sensitivity, precision and resolution. Principle and block diagram of analog and digital multimeter, Block diagram of CRO, Measurements using CRO, Lissajous patterns, Principle and block diagram of DSO, function generator.	4	
	Testing of Electronic components.	1	
END SEMESTER EXAM			

Course No.	Course Name	L-T-P-Credits	Year of Introduction
BE101-05	INTRODUCTION TO COMPUTING AND PROBLEM SOLVING	2-1-0-3	2015

Course Objectives

1. To learn basics of digital computers
2. To develop problem solving skills
3. To learn programming and to solve problems using computers

Syllabus

Introduction to digital computer, Introduction to programming languages, Operating systems, Problem Solving strategies, Examples for algorithms and flow charts, Introduction to C language, Operators and expressions. Data input and output, Functions, Scope rules and storage classes, Arrays and strings, Examples of two dimensional array - matrix operations etc., Pointers, Memory allocation functions, Bitwise operations, Data files, Command line arguments.

Expected outcome

1. Ability to design algorithmic solution to problems.
2. Ability to convert algorithms to Python programs.
3. Ability to design modular Python programs using functions
4. Ability to design programs with Interactive Input and Output, utilizing arithmetic expression repetitions, decision making, arrays.
5. Ability to design programs using file Input and Output.
6. Ability to develop recursive solutions.

Text Books:

1. Computer Fundamentals, Anita Goel, Pearson Education
2. Computer Basics and C Programming, V. Rajaraman, Prentice-Hall India
3. How to think like a Computer Scientist: Learning with Python, Allen Downey et al., Green Tea Press

References Books:

1. Prelude to Programming: Concepts & Design, Stewart Venit and Elizabeth Drake, Pearson India.
2. How to solve it by Computer, R.G. Dromy, Pearson India.
3. Fundamentals of Computers, V. Rajaraman, Pretice Hall India
4. Problem Solving & Programming Concepts, Maureen Sprankle , Pearson India
5. Introduction to Computing and Programming in Python, Mark J Guzdial, Pearson India
6. Think Python, Allen Downey, Shroff Publisher Oreilly
7. Head First Python, Paul Barry, Oreilly Publishers
8. Python Programming: An Introduction to Computer Science, John Zelle, Franklin, Beedle & Associates Inc

Course Plan			
Module	**Contents**	**Hours**	**Sem. Exam Marks**
I	Introduction to digital computer – Von Newman concept – A simple model of computer with acquisition of data, storage of data, processing of data, output of processed data. Details of functional units of a computer. Storage – primary storage and secondary storage. (The discussion should focus more on the functionalities of the units and their interaction than on specific hardware details. However, concepts like memory cells and their addressability (need not be binary), registers, inter-connections (buses) have to introduced at an abstract level. For storage devices – primary and secondary –, various categories have to be introduced along with their distinguishing features. For I-O devices also, various categories are to be introduced. The Von Newman concept should be effectively introduced. History computers need not be taught. However, students have to be encouraged to read the relevant sections of the text book. Chapters 1 – 4 of the first text book may be used to guide teaching and learning.) Introduction to programming languages: types of programming languages - high level language , assembly language and machine language System software - Operating systems – objectives of operating systems, compiler, assembler and interpreter. (For all the above topics, focus more on the concepts, significance and objectives. Chapter 6 and 7 (up to 7.4) of the first text book may be used to guide the teaching-learning process.)	8	15
II	Problem Solving strategies – Problem analysis – formal definition of problem – Solution – top- down design – breaking a problem into sub problems- overview of the solution to the sub problems by writing step by step procedure (algorithm) - representation of procedure by flowchart - Implementation of algorithms – use procedures to achieve modularity. (This part should initially look into problems in general instead of looking into computer-solvable problems alone.) Examples for algorithms and flow charts - at least 10 problems (starting with non numerical examples, and numeric problems like factorial, largest among three numbers, largest among N, Fibonacci etc.) must be discussed in detail. (Class assignments and/or tutorials may be used to strengthen understanding of this part. Chapters 4 and 5 of the second text book may be	8	15

	used for the teaching-learning process.)		
FIRST INTERNAL EXAM			
III	Introduction to Python – variables, expressions and statements, evaluation of expressions, precedence, string operations (Note:- the instructor can demonstrate simple programs to the students and encourage them to develop similar ones. Chapters 1 and 2 of the third text book have to be covered.) Functions, calling functions, type conversion and coercion, composition of functions, mathematical functions, user-defined functions, parameters and arguments. (Note: - Chapter 3 of the second text book has to be covered. The instructor should demonstrate each aspect of the function with real examples and encourage students to develop their own.)	8	15
IV	Control statements, Boolean expressions and logical operators, conditional and alternative executions (Note: - Chapter 4 of the third text book up to Section 4.9 has to be covered. The instructor should demonstrate each of these concepts with real examples and encourage students to develop as many as possible.) Iteration - while statement and tables. (Note: - Chapter 6 of the third text book has to be covered.)	6	15
SECOND INTERNAL EXAM			
V	Strings and lists – string traversal and comparison with examples. (Note: - Chapter 7 of the third text book has to be covered.) List operations with examples (Note: - Chapter 8 of the third text book up to Section 8.6 has to be covered.); tuples and dictionaries – operations and examples (Note: - Chapters 9 & 10 of the third text have to be covered.)	6	20
VI	Files and exceptions – text files, directories (Note: - Chapter 11 of the third text book has to be covered.). Introduction to classes and objects – attributes, instances (Note: - Chapter 12 of the third text book up to Section 12.6 has to be covered.)	6	20
END SEMESTER EXAM			

Course No.	Course Name	L-T-P-Credits	Year of Introduction
BE101-06	INTRODUCTION TO CHEMICAL ENGINEERING	2-1-0-3	2015

Course Objectives

1. To instil in students the interest, excitement, and urge to learn the subject of Chemical Engineering
2. To introduce the profession of Chemical Engineering
3. To introduce the purpose of learning important subjects in Chemical Engineering for meeting the requirement of various professional fields in Chemical Engineering.

Syllabus

Introduction to Chemical Engineering, profession, plant operation, Basic concepts of units and equations of state, Overview of unit operations and processes, Modes of heat transfer, chemical reactions, DCDA process, basic concepts of P&I diagram. Introduction to process instrumentation and control, Introduction to safety in chemical process industries, introduction to Environmental Engineering, Challenges of Chemical Engineer, Introduction to novel materials and their development.

Expected outcome

The student will demonstrate the ability to understand the basic concepts of Chemical Engineering

Text Books:

1. W.L. McCabe and J.C. Smith and Peter Harriott, Unit Operations in Chemical Engineering, McGraw Hill
2. S. Pushpavanam, Introduction to Chemical Engineering, PHI Learning Pvt. Ltd.

References Books:

1. Badger and Banchero, Introduction to Chemical Engineering, McGraw Hill
2. Robin Smith, Chemical Process Design and Integration, Wiley

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	Introduction to Chemical Engineering: history of Chemical Engineering, role of Chemical Engineering– a broad overview; chemical industries in India; introduction to Chemical Engineering profession; introduction to chemical plant operation; process development and process design.	6	15
II	Basic concepts: units and dimensions, systems of units, conversion and conversion factors of units, concept of mole, weight percent, mole percent, normality, molarity, molality, vapor pressure, partial pressure, concept of ideal gas and equations of state.	7	15

FIRST INTERNAL EXAM			
III	Overview of unit operations such as distillation, evaporation, absorption, adsorption, extraction, crystallization, drying, leaching, size separation and size reduction. Overview of unit processes like saponification, polymerization, biodiesel formation and hydrogenation.	8	15
IV	Modes of heat transfer-principles of conduction, convection and radiation, heat exchangers. Fluid flow- laminar and turbulent flow. Introduction to transportation of fluids. Classification of chemical reactions, order of reaction, rate equation, Arrhenius equation, conversion and yield, batch reactor, mixed reactor and plug flow reactor.	8	15
SECOND INTERNAL EXAM			
V	Block diagram, process flow diagram for DCDA process for Sulphuric acid manufacture, basic concepts of P&I diagram. Introduction to process instrumentation and control: common methodologies of measurements, measuring instruments: thermocouple, venturimeter, U-tube manometer, elements of feedback control loop, introduction to control of a distillation column.	7	20
VI	Introduction to safety in chemical process industries – basic concepts, Case study: Bhopal gas tragedy. Introduction to Environmental Engineering - basic concepts, Typical wastewater, air and solid waste management system.Case study: Effect of Aerial Spraying of Endosulfan on Residents of Kasargod, Kerala. Challenges of Chemical Engineer –need for sustainable alternatives for processes; products with environment friendly life-cycle. Introduction to novel materials and their development.	6	20
END SEMESTER EXAM			

Course No.	Course Name	L-T-P-Credits	Year of Introduction
BE103	INTRODUCTION TO SUSTAINABLE ENGINEERING	2-0-1-3	2015

Course Objectives

The purpose of this course is:-

1. To have an increased awareness among students on issues in areas of sustainability
2. To have an insight into global environmental issues
3. To establish a clear understanding of the role and impact of various aspects of engineering and engineering decisions on environmental, societal, and economic problems.

Syllabus

Sustainability- need and concept, understanding sustainability and threats, environment acts and legislations for protection of resources; Different types of tools for assessing sustainability in engineering, Environmental Impact Assessment studies; Energy, Conventional and renewable sources, Green buildings, green materials; Natural resources and their pollution, preservation of resources, treatment of pollutants, Different types of waste, waste to energy concept, Global effects of pollution

Expected outcome

The student will be

- Able to appreciate and explain the different types of environmental pollution problems and their sustainable solutions
- Able to apply the concepts of sustainability in their respective area of specialization

References Books:

1. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London,
2. Introduction to Environmental Engineering: special indian edition,Mackenzie Davis, David Cornwell, Amazon.com
3. Anil Markandya, Climate Change and Sustainable Development: Prospects for Developing Countries, Routledge
4. EIA Guidelines, Notification of Govt of India, Environment Impact Assessment, 2006
5. Text book for Environmental studies, Erach Bharucha, UGC, NewDelhi, ebook, collegesat.du.ac.in/UG/Environmental%20Studies_ebook.pdf
6. Garg HP, J Prakash, Solar Energy: Fundamentals and Applications, Tata McGraw Hill
7. Renewable Sources of Energy and Conversion Systems: N.K.Bansal and M.K.Kleeman.
8. ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency Publications-Rating System, TERI PUBLICATIONS – GRIHA Rating System, LEEDS Publications
9. Systems Analysis for Sustainable Engineering: Theory and Applications, Ni bin Chang, Amazon.com
10. John W Twidell and Anthony D Weir, Renewable Energy Resources, English Language Book

Society (ELBS) 1996.
11. D P Kothari, K C Singal, Rakesh Ranjan, Renewable Energy Sources and Emerging Technologies, Prentice Hall of India
12. S.S Purohit , Green Technology-An approach for sustainable environment, Agrobios publication
13. Mihelcic, J. R. and Zimmerman, J. B., Environmental Engineering, Wiley Publishers.
14. Brennen, D. Sustainable Process Engineering, Pan Stanford Publishers.

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	Only the introductory concepts of the contents be covered Sustainability- Introduction, Need for sustainability, Concept of sustainability, social, environmental and economic sustainability concepts.	L3	**15**
	Sustainable development, Engineering for sustainable development, Threats for sustainability, Low Impact development techniques. Environmental ethics, Environmental education, multilateral environmental agreements and Protocols –Environmental legislations in India- Water act, Air act	L2	
	Examples for project work: 1. Identifying/assessment of sustainability in your neighbourhood in education, housing, water resources, energy resources, food supplies, land use, environmental protection etc. 2. Identify the threats for sustainability in any selected area and explore solutions for the same **3.** Suggest some LID activities that can be adopted	P2	
II	Tools for sustainability, Life cycle assessment, procedure for LCA, case studies	L2	**15**
	ISO 14000, bio mimicking, responsibility of industries, industrial ecology, industrial symbiosis, cleaner production, clean development mechanism. Environment Impact Assessment, Procedures of EIA in India, Environmental auditing, Case studies in environmental sustainability	L3	
	Examples for project work: 1. Conducting LCA of products (eg. Aluminium cans, PVC bottles, cars etc. or activities (Comparison of land filling and open burning) 2. Conducting an EIA study of a small project (eg. Construction of a building)	P2	
FIRST INTERNAL EXAM			
III	Basic concepts of sustainable habitat, Green buildings, green materials for building construction, material selection for sustainable design, green building certification.	L3	**15**

	Methods for increasing energy efficiency of buildings, Sustainable cities, Sustainable transportation, Case studies in sustainable engineering.	L2	
	Examples for project work: 1. Consider the design of a sustainable building for your campus 2. Explore the different methods that can be adopted for maintaining a sustainable transport system in your city	P2	
IV	Air pollution- sources of air pollution, vehicular and industrial, types of air pollutants, Effects of air pollutants.	L2	15
	Global environmental issues, Resource degradation, Desertification, wetland reclamation, Climate change, Ozone layer depletion, Carbon credits and carbon trading, carbon foot print.	L3	
	Examples for project work: 1. Collect details for instances of climate change in your locality. 2. Find out the carbon credits you can gain by using a sustainable transport system (travelling in a cycle or car pooling from college to home)	P2	
SECOND INTERNAL EXAM			
V	Energy sources: Basic concepts-Conventional and non-conventional, solar energy, solar thermal systems, solar photo voltaic systems, Fuel cell.	L2	**20**
	Wind energy, Small hydro plants, Biomass: types of biogas plants, bio fuels, Energy derived from oceans, tides and waves, Geothermal energy. Energy conservation, Integration of alternate energy sources	L3	
	Examples for project work: Design a photovoltaic system for a house Find out the energy savings that can be achieved by the installation of a solar water heater Conduct a feasibility study for the installation of wind mills in Kerala	P2	
VI	Water pollutants- sources, persistent pollutants, Rain water harvesting, water quality standards, sustainable wastewater treatment methods, Energy from wastewater.	L2	**20**
	Solid waste - sources, effects of solid waste pollutants, leachate, Hazardous wastes, e wastes, plastic wastes, Radioactive wastes, Zero waste concept, 3R concept, waste to energy concept.	L3	
	Examples for project work: Design of biogas digesters for a small community Advantages of installing rain water harvesting systems in campus Assessing the pollution status of a small area Programmes for enhancing public environmental awareness Observe a pond nearby and think about the different measures that can be adopted for its conservation	P2	
END SEMESTER EXAM			

Course No.	Course Name	L-T-P-Credits	Year of Introduction
CE100	BASICS OF CIVIL ENGINEERING	2-1-0-3	2015

Course Objectives

1. To inculcate the essentials of Civil Engineering field to the students of all branches of Engineering.
2. To provide the students an illustration of the significance of the Civil Engineering Profession in satisfying societal needs.

Syllabus

General introduction to Civil Engineering - Introduction to types of buildings, Components of a residential building, Introduction to industrial buildings; Introduction to planning of residential buildings - Simple building plans; Introduction to the various building area terms; Setting out of a building; Surveying – Principles, Objectives, Horizontal measurements with tapes, Ranging; Levelling – Instruments, Reduction of levels; Modern surveying instruments; Building materials – Bricks, cement blocks, Cement, Cement mortar, Steel; Building construction – Foundations, Brick masonry, Roofs, Floors, Decorative finishes, Plastering, Paints and Painting; Basic infrastructure and services – Elevators, Escalators, Ramps, Air conditioning, Sound proofing, Towers, Chimneys, Water Tanks; Intelligent buildings.

Expected outcome

1. The students will be able to illustrate the fundamental aspects of Civil Engineering.
2. The students will be able to plan and set out a building.
3. Students will be able to explain the concepts of surveying for making horizontal and vertical measurements.
4. They will able to illustrate the uses of various building materials and explain the method of construction of different components of a building.
5. Students will be able to discuss about various services in a building.

Text Books:

1. Satheesh Gopi, Basic Civil Engineering, Pearson Publishers
2. Rangwala, Essentials of Civil Engineering, Charotar Publishing House

References Books:

1. Anurag A. Kandya, Elements of Civil Engineering, Charotar Publishing house
2. Rangwala S C and Ketki B Dalal, Engineering Materials, Charotar Publishing house
3. Rangwala S C and Ketki B Dalal, Building Construction, Charotar Publishing house
4. Michael S Mamlouk and John P Zaniewski, Materials for Civil and Construction Engineering,

Pearson Publishers

5. McKay, W. B. and McKay, J. K., Building Construction Volumes 1 to 4, Pearson India Education Services
6. R. Chudley, Construction Technology, Vol. I to IV, Longman Group, England
7. R. Chudley and R. Greeno, Building Construction Handbook, Addison Wesley, Longman Group, England

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	General Introduction to Civil Engineering - Various disciplines of Civil engineering, Relevance of Civil engineering in the overall infrastructural development of the country.	2	15
	Introduction to types of buildings as per NBC; Selection of site for buildings.	2	
	Components of a residential building and their functions. Introduction to industrial buildings – office / factory / software development office / power house /electronic equipment service centre (any one related to the branch of study)	2	
	Students have to visit one such building and submit an assignment about the features of any one of the listed building related to their branch (Not included for exam).	1	
II	Building planning - Introduction to planning of residential buildings- Site plan, Orientation of a building, Open space requirements, Position of doors and windows, Size of rooms; Preparation of a scaled sketch of the plan of a single storeyed residential building in a given site plan.	4	15
	Introduction to the various building area terms - Computation of plinth area / built up area, Floor area / carpet area - for a simple single storeyed building; Setting out of a building.	3	
FIRST INTERNAL EXAM			
III	Surveying - Principles and objectives of surveying;	1	15
	Horizontal measurements – instruments used – tape, types of tapes; Ranging (direct ranging only) – instruments used for ranging.	3	
	Levelling - Definitions, principles, Instruments (brief discussion only) - Level field book - Reduction of levels - problems on levelling (height of collimation only).	3	
	Modern surveying instruments – Electronic distance meter, digital level, total station, GPS (Brief discussion only).	1	
IV	Building materials - Bricks, cement blocks - Properties and specifications.	2	15

	Cement – OPC, properties, grades; other types of cement and its uses (in brief).	1	
	Cement mortar – constituents, preparation.	1	
	Concrete – PCC and RCC – grades.	1	
	Steel - Use of steel in building construction, types and market forms.	1	
SECOND INTERNAL EXAM			
V	Building construction – Foundations; Bearing capacity of soil (definition only); Functions of foundations, Types - shallow and deep (sketches only).	2	20
	Brick masonry – header and stretcher bond, English bonds – Elevation and plan (one brick thick walls only).	2	
	Roofs – functions, types, roofing materials (brief discussion only).	1	
	Floors – functions, types; flooring materials (brief discussion only).	1	
	Decorative finishes – Plastering – Purpose, procedure.	1	
	Paints and Painting – Purpose, types, preparation of surfaces for painting (brief discussion only).	2	
VI	Basic infrastructure and services - Elevators, escalators, ramps, air conditioning, sound proofing (Civil engineering aspects only)	2	20
	Towers, Chimneys, Water tanks (brief discussion only).	1	
	Concept of intelligent buildings.	2	
END SEMESTER EXAM			

Course No.	Course Name	L-T-P-Credits	Year of Introduction
ME100	BASICS OF MECHANICAL ENGINEERING	2-1-0-3	2015

Course Objectives

To expose the students to the thrust areas in Mechanical Engineering and their relevance by covering the fundamental concepts.

Syllabus

Thermodynamics, laws of thermodynamics, implications, cycles, energy conversion devices, steam and water machines, engines, turbo machines, refrigeration and air conditioning, power transmission devices in automobiles, latest trends, engineering materials and manufacturing processes, types of materials, alloys, shape forming methods, machine tools.

Expected outcome

The student will be able to understand the inter dependence of the thrust areas in Mechanical Engineering and their significance leading to the development of products, processes and systems.

Text Books:

1. Fundamentals of Mechanical Engineering – G S Sawhney– PHI
2. Basic Mechanical Engineering – Balachandran Owl Books
3. Basic Mechanical Engineering – J Benjamin Pentex Books

References Books:

1. An Introduction to Mechanical Engineering Part I – Michael Clifford, Kathy Simmons and Philip Shipway. CRC Press
2. Basic and Applied Thermodynamics – P. K Nag – Tata McGraw-Hill
3. Basic Mechanical Engineering - Pravin Kumar
4. Fundamentals of IC Engines- Gill, Smith and Zuirys - Oxford and IBH publishing company Pvt. Ltd. New Delhi. Crouse, Automobile Engineering, Tata Mc-Graw-Hill, New Delhi.
5. Roy and Choudhary, Elements of Mechanical Engineering, Media Promoters & Publishers Pvt. Ltd., Mumbai.
6. Automobile Engineering, Crouse- Tata Mc-Graw-Hill, New Delhi

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	Thermodynamics: Laws of Thermodynamics, significance and applications of laws of thermodynamics; entropy, available energy; Clausius inequality; principle of increase of entropy; Ideal and real gas equations; Analysis of Carnot cycle, Otto cycle , Diesel cycle and Brayton cycle; Efficiency of these cycles.	7	15
II	Energy conversion devices: Boilers, Steam turbines, Gas turbines and	7	15

	Hydraulic turbines; Working principle of two stroke and four stroke I.C. Engines (Diesel and Petrol), Reciprocating and centrifugal pumps, rotary pumps, reciprocating and centrifugal compressors, fans, blowers, rotary compressors; Air motor.		
FIRST INTERNAL EXAM			
III	Refrigeration and Air Conditioning: Vapour compression and absorption refrigeration systems, COP, Study of household refrigerator, Energy Efficiency Rating, Psychrometry, Psychrometric processes, window air conditioner, split air conditioner. Ratings and selection criteria of above devices. Refrigerants and their impact on environment.	7	15
IV	Engines and Power Transmission Devices in Automobiles, Different types of engines used in automobiles, types of automobiles; major components and their functions (Description only); Fuels; Recent developments: CRDI, MPFI, Hybrid engines. Belts and belt drives; Chain drive; Rope drive; Gears and gear trains; friction clutch (cone and single plate), brakes (types and applications only); Applications of these devices.	7	15
SECOND INTERNAL EXAM			
V	Materials and manufacturing processes: Engineering materials, Classification, properties, Alloys and their Applications; Casting, Sheet metal forming, Sheet metal cutting, Forging, Rolling, Extrusion, Metal joining processes - Powder metallurgy.	7	20
VI	Machine Tools (Basic elements, Working principle and types of operations) Lathe – Centre Lathe, Drilling Machine – Study of Pillar drilling machine, Shaper, planer, slotter, Milling Machine, Grinding machine, Power saw; Introduction to NC and CNC machines.	7	20
END SEMESTER EXAM			

Course No.	Course Name	L-T-P-Credits	Year of Introduction
EE100	BASICS OF ELECTRICAL ENGINEERING	2-1-0-3	2015

Course Objectives

To impart a basic knowledge in Electrical Engineering with an understanding of fundamental concepts.

Syllabus

Elementary concepts of electric circuits, Kirchhoff's laws, constant voltage and current sources, Matrix representation; Magnetic circuits, energy stored in magnetic circuits, Electromagnetic induction, Alternating current fundamentals; AC circuits, Phasor representation of alternating quantities- rectangular, polar and exponential forms; Three phase systems, star and delta connection; Generation of power, Power transmission and distribution; Transformers, Electric Machines- D.C. Machines, AC Motors; Tariff, Wiring systems, Lamps.

Expected outcome

The course will enable the students to gain preliminary knowledge in basic concepts of Electrical Engineering.

Text Books:

1. Sudhakar and Syam Mohan, Circuits and Networks Analysis and Synthesis, Tata McGraw Hill.
2. S.K. Bhattachariya, Basic Electrical & Electronics Engineering, Pearson.
3. V. K. Mehta, Rohit Mehta, Basic Electrical Engineering, S. Chand Publishing.

References Books:

1. Vincent Del Toro, Electrical Engineering Fundamentals, Prentice Hall of India.
2. Hughes, Electrical and Electronic Technology, Pearson Education South Asia.
3. Parker and Smith, Problems in Electrical Engineering, CBS Publishers and Distributers.
4. Hayt W. H., J. E. Kemmerly and S.M. Durbin Engineering Circuit Analysis, Tata McGraw Hill.
5. John Bird, Electrical Circuit Theory and Technology, Routledge, Taylor & Francis Group.

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	Elementary concepts of electric circuits: Kirchhoff's laws, constant voltage and current sources, formation of network equations by node voltage and mesh current methods. Matrix representation - solution of network equations by matrix methods, star-delta conversion (Analysis of resistive networks only). Numerical problems.	6	15
II	Magnetic circuits: MMF, field strength, flux density, reluctance, energy stored in magnetic circuits.	9	15

	Electromagnetic induction: Faraday's laws, Lenz's law-statically induced and dynamically Induced emfs- self-inductance and mutual inductance, coefficient of coupling. Alternating current fundamentals: Generation of alternating voltages, waveforms frequency, period, average and RMS values and form factor. Numerical problems.		
FIRST INTERNAL EXAM			
III	AC Circuits: Phasor representation of alternating quantities- rectangular, polar and exponential forms. Analysis of simple AC circuits - concept of impedance. Power and power factor in AC circuits- active, reactive and apparent power. Solution of RL, RC and RLC circuits. Three phase systems: Generation of three phase voltages- advantages of three phase systems, star and delta connection, three wire and four wire systems, relation between line and phase voltages, line and phase currents. Three phase power measurement by two wattmeter method. Numerical problems.	9	15
IV	Generation of power: Block schematic representation of generating stations- hydroelectric, thermal and nuclear power plants. Renewable energy sources. Power transmission and distribution: Typical electrical power transmission scheme, need for high voltage transmission, substation equipments, primary and secondary transmission and distribution systems.	6	15
SECOND INTERNAL EXAM			
V	Transformers: construction of single phase and three phase transformers (core type only) – EMF equation, losses and efficiency. Electric Machines: D.C. Machines - Construction, types, principles of operation of dc motor, applications. AC Motors - Construction, principles of operation of single phase and three phase induction motor. Principle of operation of Universal motor.	6	20
VI	Tariff: Different types of LT and HT consumers, tariff schemes - uniform tariff and differential tariff. Wiring systems: Basic concepts of wiring (conduit wiring only), service mains, meter board and distribution board. Earthing of installations - necessity of earthing, plate & pipe earthing, protective fuses, MCB, ELCB. Lamps: Different types of lamps - Incandescent lamps, fluorescent, mercury vapour, sodium vapour, metal halide and LED lamps.	6	20
END SEMESTER EXAM			

Course No.	Course Name	L-T-P-Credits	Year of Introduction
EC100	BASICS OF ELECTRONICS ENGINEERING	2-1-0-3	2015

Course Objectives

1. To get basic idea about types, specification and common values of passive components.
2. To familiarize the working and characteristics of diodes, transistors, MOSFETS and some measuring instruments.
3. To understand working of diodes in circuits and in rectifiers.

Syllabus

Evolution and Impact of Electronics in industries and in society, Familiarization of Resistors, Capacitors, Inductors, Transformers and Electro mechanical components, PN Junction diode: Structure, Principle of operation, Photo diode, LED, Solar cell, Bipolar Junction Transistors: Structure, Principle of operation, characteristics, Rectifiers and power supplies: Half wave and full wave rectifier, capacitor filter, zener voltage regulator, Amplifiers and Oscillators: common emitter amplifier, feedback, oscillators, RC phase shift oscillator, Analogue Integrated circuits: operational amplifier, inverting and non inverting amplifier, comparator, Electronic Instrumentation: digital multimeter, digital storage oscilloscope, function generator, Radio communication: principle of AM & FM, super heterodyne receiver, Radar system: Principle, block diagram of pulsed radar, Satellite communication: geo-stationary satellite, transponder, Global Positioning System, Mobile communication: cellular communications, cells, GSM, Optical communication: system, principle of light transmission through fiber, Entertainment Electronics: Color television, cable TV, CCTV system, HDTV, LCD & LED displays.

Expected outcome

Student can identify the active and passive electronic components. Student can setup simple circuits using diodes and transistors. Student will get fundamental idea about basic communication systems and entertainment electronics.

Text Books:

1. David A Bell, Electronic Devices and Circuits, Oxford University Press
2. Wayne Tomasy, Advanced Electronic Communication system, PHI Publishers

References Books:

1. Robert L. Boylested, Louis Nashelsky, Electronic Devices and Circuit Theory, Pearson Education
2. George Kennedy, Bernard Davis, Electronic Communication Systems, Mc Graw Hill
3. Louis E. Frenzel, Principles of Electronic Communication Systems, Mc Graw Hill

Course Plan

Module	Contents	Hours	Sem. Marks
I	Evolution of Electronics, Impact of Electronics in industry and in society.	1	10
	Resistors, Capacitors: types, specifications. Standard values, marking,	3	

	colour coding.		
	Inductors and Transformers: types, specifications, Principle of working.	2	
	Electro mechanical components: relays and contactors.	1	
II	PN Junction diode: Intrinsic and extrinsic semiconductors, Principle of operation, V-I characteristics, principle of working of Zener diode, Photo diode, LED and Solar cell.	3	20
	Bipolar Junction Transistors: PNP and NPN structures, Principle of operation, input and output characteristics of common emitter configuration, Typical specifications of low, medium and high power and frequency diodes and transistors, packaging.	4	
FIRST INTERNAL EXAM			
III	Rectifiers and power supplies: Block diagram description of a dc power supply ,Half wave and full wave (including bridge) rectifier, capacitor filter, working of simple zener voltage regulator, Principle of SMPS	4	15
	Amplifiers and Oscillators: Circuit diagram and working of common emitter amplifier, Block diagram of Public Address system, concepts of feedback, working principles of oscillators, circuit diagram & working of RC phase shift oscillator.	3	
IV	Analogue Integrated circuits: Functional block diagram of operational amplifier, ideal operational amplifier, inverting and non inverting amplifier, comparator.	3	15
	Digital ICs: Logic Gates.	1	
	Electronic Instrumentation: Principle and block diagram of digital multimeter, principle of digital storage oscilloscope, principle and block diagram of function generator.	3	
SECOND INTERNAL EXAM			
V	Radio communication: principle of AM & FM, frequency bands used for various communication systems, block diagram of super heterodyne receiver.	3	20
	Radar system: Principle, block diagram of pulsed radar.	1	
	Satellite communication: concept of geo-stationary satellite, satellite transponder, advantages, principle of Global Positioning System.	3	
VI	Mobile communication: basic principles of cellular communications, concepts of cells, frequency reuse, principle and block diagram of GSM.	2	20
	Optical communication: block diagram of the optical communication system, principle of light transmission through fiber, advantages of optical communication systems.	2	
	Entertainment and Security Electronics Technology: Basic principles of cable TV, CCTV, DTH system, HDTV, Plasma, LCD, LED TV.	3	
END SEMESTER EXAM			

Course No.	Course Name	L-T-P-Credits	Year of Introduction
MA102	DIFFERENTIAL EQUATIONS	2-1-0-3	2015

Course Objectives

Students will be able to understand the fundamental concepts, theories and methods in Differential Equations and will be able to apply the concepts and methods described in the syllabus in various engineering and technological applications.

Syllabus

First order ordinary differential equations, second order ordinary differential equations, higher order linear differential equations, Fourier series, partial differential equations, applications of partial differential equations.

Expected outcome

Students must understand the fundamental concepts, theories and methods in differential equations and will be able to apply the concepts and methods described in the syllabus through class room teaching, text books, assignments and practice using software.

Text Books:

1. Erwin Kreyszig: Advanced Engineering Mathematics, Wiley
2. A C Srivastava, P K Srivasthava, Engineering Mathematics Vol 2. PHI Learning Private Ltd

References Books:

1. S. L. Ross. Differential Equations, Wiley
2. Mathematical Methods for Science and Engineering. Datta, Cengage Learing,
3. B. S. Grewal. Higher Engineering Mathematics, Khanna Publishers, New Delhi.
4. N. P. Bali, Manish Goyal. Engineering Mathematics, Lakshmy Publications
5. D. W. Jordan, P Smith. Mathematical Techniques, Oxford University Press
6. C. Henry Edwards, David. E. Penney. Differential Equations and Boundary Value Problems. Computing and Modeling, Pearson

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS (Book 1. Sections: 1.1, 1.3, 1.4, 1.5, 1.6) Introduction –Basic Concepts, Modelling. Separable ODEs, Modelling-Exact ODEs, Integrating Factors-Linear ODEs, Bernoulli Equation, Population Dynamics-Orthogonal Trajectories. (Theorems need not be proved. Sketching, plotting and interpretation of solutions of differential equations using suitable software)	9	15

II	SECOND ORDER LINEAR ORDINARY DIFFERENTIAL EQUATIONS (Book 1. Sections: 2.1, 2.2, 2.4, 2.7, 2.8, 2.10) Homogeneous Linear ODEs of Second Order -- Homogeneous Linear ODEs with Constant Coefficients-Modelling of free oscillations of a Mass Spring system –Non-Homogeneous ODEs-Modelling: Forced Oscillations, Resonance – Solution by Variation of Parameters. (Theorems need not be proved. Sketching, plotting and interpretation of solutions of differential equations using suitable software)	8	15
FIRST INTERNAL EXAM			
III	HIGHER ORDER LINEAR ORDINARY DIFFERENTIAL EQUATIONS (Book 1. Section: 3.1, 3.2, 3,2) Homogeneous linear ODEs- Initial value problem-Existence, uniqueness (without proof)- Homogeneous linear ODEs with constant coefficients-Non-Homogeneous linear ODEs-Method of variation of Parameters-Bending of elastic beam under a load. (Theorems need not be proved)	10	15
IV	FOURIER SERIES (Book 2. Section: 4.1, 4.2, 4.3, 4.4) Periodic Functions-Orthogonality of Sin and Cosine functions- Euler's formula-Fourier series for even and odd functions-Half range expansions-half range Fourier cosine series - Half range Fourier sine series. (Use of soft ware's to understand the convergence of Fourier series, sketching of partial sums)	10	15
SECOND INTERNAL EXAM			
V	PARTIAL DIFFERENTIAL EQUATION (Book 2. Section: 5.1.1, 5.1.2, 5.1.3, 5.1.4, 5.1.5, 5.1.9, 5.1.10, 5.2.6, 5.2.7, 5.2.8, 5.2.9, 5.2.10) Formation of PDEs-solutions of a first order PDE- General integral from complete solution-Method for solving first order PDE-Lagrange's Method-Linear PDE with Constant Coefficients-Solution of Linear Homogeneous PDE with Constant Coefficient.	10	20
VI	APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS (Book 2. Section: 6.1, 6.2, 6.3, 6.4, 6.7, 6. 8, 6. 9, 6.9.1, 6.9.2) Method of Separation of Variables- Wave equation-Vibrations of a Stretched sting, Solution of one dimensional equation-The equation of Heat conduction – One dimensional Heat equation- Solution of one dimensional Heat equation –A long insulated rod with ends at zero temperatures- A long insulated rod with ends at non-zero temperatures.	9	20
END SEMESTER EXAM			

Course No.	Course Name	L-T-P-Credits	Year of Introduction
BE102	DESIGN AND ENGINEERING	2-0-2-3	2015

Course Objectives

The purpose of this course is:-

1. To excite the student on creative design and its significance;
2. To make the student aware of the processes involved in design;
3. To make the student understand the interesting interaction of various segments of humanities, sciences and engineering in the evolution of a design;
4. To get an exposure as to how to engineer a design.

Syllabus

Design and its objectives; Role of Science, Engineering and Technology in design; Engineering as a business proposition;

How to initiate creative designs? Understanding the process of design, with examples; design process, including defining design problems, generating ideas, and building solutions. Design evaluation, and communication of designs; Design for function and strength with examples; Role of standards in design; Material selection in design; Design for quality; Role of value engineering in design; Design for "X"; Product oriented and user oriented designs; Culture based design; Aesthetics and Ergonomics; Concepts of concurrent engineering; Role of reverse engineering in design; Modular design; Design optimization;

Design of intelligent products; Human reaction to intelligent products; Communication between products; Internet of things; Autonomous products; Product life cycle; Products and the environment; Product recycling; Re-engineering; Design as a marketing tool; IPR and design; Product liability.

Expected outcome

The student will be:-

1. Able to appreciate the different elements involved in good designs and to apply them in practice when called for.
2. Aware of the product oriented and user oriented aspects that make the design a success.
3. Will be capable to think of innovative designs incorporating different segments of knowledge gained in the course;
4. Students will have a broader perspective of design covering function, cost, environmental sensitivity, safety and other factors other than engineering analysis.

References Books:

1. Engineering Design-A project based introduction- Clive L.Dym, Patrick Little, Elizabeth J.Orwin, Wiley , ISBN-978-1-118-32458-5
2. Engineering by Design, Gerald Voland, ISBN 978-93-325-3505-3, Pearson India

3. Exploring Engineering, Third Edition: An Introduction to Engineering and Design – [Part 3-Chapters 17 to 27], Robert T. Balmer , William D. Keat, George Wise, Philip Kosky, ISBN-13: 978-0124158917 ISBN-10: 0124158919
4. Design for X Concurrent engineering imperativesEastman, Charles M. (Ed.), 1996, XI, 489 p. ISBN 978-94-011-3985-4 Springer
5. Engineering Design: A Systematic Approach, Pahl, G., Beitz, W., Feldhusen, J., Grote, K.-H.3rd ed. 2007, XXI, 617 p., ISBN 978-1-84628-319-2

Web page:

1. E-Book (Free download): http://opim.wharton.upenn.edu/~ulrich/designbook.html
2. http://www2.warwick.ac.uk/fac/sci/wmg/ftmsc/modules/modulelist/peuss/designforx/design_for_x_notes_section_5.pdf

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	Design and its objectives; Design constraints, Design functions, Design means and Design from; Role of Science, Engineering and Technology in design; Engineering as a business proposition; Functional and Strength Designs. Design form, function and strength;	L2	15
	How to initiate creative designs? Initiating the thinking process for designing a product of daily use. Need identification; Problem Statement; Market survey-customer requirements; Design attributes and objectives; Ideation; Brain storming approaches; arriving at solutions; Closing on to the Design needs.	L3	
	An Exercise in the process of design initiation. A simple problem is to be taken up to examine different solutions-Ceiling fan? Group Presentation and discussion.	P4	
II	Design process- Different stages in design and their significance; Defining the design space; Analogies and "thinking outside of the box"; Quality function deployment-meeting what the customer wants; Evaluation and choosing of a design.	L2	15
	Design Communication; Realization of the concept into a configuration, drawing and model. Concept of "Complex is Simple". Design for function and strength. Design detailing- Material selection, Design visualisation- Solid modelling; Detailed 2D drawings; Tolerancing; Use of standard items in design; Research needs in design; Energy needs of the design, both in its realization and in the applications.	L3	
	An exercise in the detailed design of two products (Stapler/ door/clock)	P4	
FIRST INTERNAL EXAM			

III	Prototyping- rapid prototyping; testing and evaluation of design; Design modifications; Freezing the design; Cost analysis.	L2	15
	Engineering the design – From prototype to product. Planning; Scheduling; Supply chains; inventory; handling; manufacturing/construction operations; storage; packaging; shipping; marketing; feed-back on design.	L3	
	List out the standards organizations. Prepare a list of standard items used in any engineering specialization. Develop any design with over 50% standard items as parts.	P4	
IV	Design for "X"; covering quality, reliability, safety, manufacturing/construction, assembly, maintenance, logistics, handling; disassembly; recycling; re-engineering etc. List out the design requirements(x) for designing a rocket shell of 3 meter diameter and 8 meter length.	L4	15
	Design mineral water bottles that could be packed compactly for transportation.	P4	
SECOND INTERNAL EXAM			
V	Product centred and user centred design. Product centred attributes and user centred attributes. Bringing the two closer. Example: Smart phone. Aesthetics and ergonomics.	L2	20
	Value engineering, Concurrent engineering, Reverse engineering in design; Culture based design; Architectural designs; Motifs and cultural background; Tradition and design; Study the evolution of Wet grinders; Printed motifs; Role of colours in design.	L4	
	Make sharp corners and change them to smooth curves-check the acceptance. Examine the possibility of value addition for an existing product.	P6	
VI	Modular design; Design optimization; Intelligent and autonomous products; User interfaces; communication between products; autonomous products; internet of things; human psychology and the advanced products. Design as a marketing tool; Intellectual Property rights – Trade secret; patent; copy-right; trademarks; product liability.	L3	20
	Group presentation of any such products covering all aspects that could make or mar it.	P6	
END SEMESTER EXAM			

Course No.	Course Name	L-T-P-Credits	Year of Introduction
PH110	ENGINEERING PHYSICS LAB	0-0-2-1	2015

Course Objectives

This course is designed (i) to impart practical knowledge about some of the phenomena they have studied in the Engineering Physics course and (ii) to develop the experimental skills of the students.

List of Exercises / Experiments (Minimum of 8 mandatory)

Basics

1. Study of application of Cathode Ray Oscilloscope (CRO) for Frequency and Amplitude measurements. Lissajeous figures (useful for different types of polarized light.)
2. Temperature measurement – Thermocouple
3. Measurement of strain using strain gauge and Wheatstones bridge.

Waves, Oscillations and Ultrasonics

4. Wave length and velocity measurement of ultrasonic waves in a liquid using ultrasonic diffractometer.
5. The LCR Circuit – Forced and damped harmonic oscillations.
6. Meldes string apparatus. Measurement of frequency in the transverse and longitudinal mode.

Interference

7. Wave length measurement of a monochromatic source of light using Newton's Rings method.
8. Determination of refractive index of a liquid using Newton's Rings apparatus.
9. Determination of diameter of a thin wire or thickness of a thin strip of paper using air wedge method.

Diffraction

10. To determine the slit or pinhole width.
11. To measure wavelength using a millimeter scale as a grating.
12. Determination the wavelength of He-Ne laser or any standard laser using diffraction grating.

13. To determine the wavelength of monochromatic light using grating.
14. Determination of dispersive power and resolving power of a plane transmission grating.

Polarisation

15. Laurent's Half Shade Polarimeter -To observe the rotation of the plane of polarization of monochromatic light by sugar solution and hence to determine the concentration of solution of optically active substance.
16. Kerr Effect - To demonstrate the Kerr effect in nitrobenzene solution and to measure the light intensity as a function of voltage across the Kerr cell using photo detector.
17. To measure the light intensity of plane polarised light as a function of the analyzer position.

Laser & Photonics

18. To determine the speed of light in air using laser.
19. Calculate the numerical aperture and study the losses that occur in optical fiber cable.
20. Determination of the particle size of lycopodium powder.
21. I-V characteristics of solar cell
22. To measure Planck's constant using photo electric cell.
23. Measurement of wavelength of laser using grating.

Expected outcome

References

Books:

1. Rao, B. S, Krishna, K. V., Engineering Physics Practicals, Laxmi Publications
2. Koser, A. A., Practical Engineering Physics, Nakoda Publishers and Printers India Ltd
3. Avadhanulu, M. N., Dani, A. A., Pokley, P. M., Experiments in Engineering Physics, S. Chand & Co.
4. Gupta, S. K., Engineering Physics Practicals, Krishna Prakashan Pvt. Ltd.
5. Sasikumar, P. R. Practical Physics, PHI.

Website:

6. http://www.indosawedu.com

Course No.	Course Name	L-T-P-Credits	Year of Introduction
CY 110	ENGINEERING CHEMISTRY LAB	0-0-2-1	2015

Course Objectives

List of Exercises / Experiments (Minimum of 8 mandatory)

1. Estimation of Total Hardness – EDTA method.
2. Estimation of Iron in Iron ore.
3. Estimation of Copper in Brass.
4. Estimation of dissolved oxygen by Winklers method.
5. Estimation of chloride in water.
6. Preparation of Urea formaldehyde and Phenol-formaldehyde resin.
7. Determination of Flash point and Fire point of oil by Pensky Martin Apparatus.
8. Determination of wavelength of absorption maximum and colorimetric estimation of Fe^{3+} in solution.
9. Determination of molar absorptivity of a compound other than Fe^{3+}.
10. Analysis of IR spectra of any three organic compounds.
11. Analysis of ^{1}H NMR spectra of any three organic compounds.
12. Calibration of pH meter and determination of pH of a solution.
13. Verification of Nernst equation for electrochemical cell.
14. Potentiometric titrations: acid – base and redox titrations
15. Conductivity measurements of salt solutions.
16. Flame photometric estimation of Na+ to find out the salinity in sand.

Expected outcome

References:

Course No.	Course Name	L-T-P-Credits	Year of Introduction
CE110	CIVIL ENGINEERING WORKSHOP	0-0-2-1	2015

Course Objectives

List of Exercises / Experiments (Minimum of 8 mandatory)

(For Civil Engineering Branch)

Setting out of a building: The student should set out a building (single room only) as per the given building plan using tape only.

Setting out of a building: The student should set out a building (single room only) as per the given building plan using tape and cross staff.

Construct a wall of height 50 cm and wall thickness 1½ bricks using English bond (No mortar required) - corner portion – length of side walls 60 cm.

Construct a wall of height 50 cm and wall thickness 2 bricks using English bond (No mortar required) - corner portion – length of side walls 60 cm.

Compute the area and/or volume of various features of a building/structure such as door and window size, number of bricks required to construct a wall of a building, diameter of bars used in windows etc. – To create an awareness of measurements and units (use tape or other simple measuring instruments like vernier caliper, screw gauge etc.).

Testing of building materials: The student should do the compression testing of any three construction materials and compare the strength (brick, hollow block, laterite block, cement concrete cube, stone block, and so on).

Computation of Centre of gravity and Moment of inertia of a given rolled steel section by actual measurements.

Introduction to simple plumbing and sanitary fittings.

Home assignment 1: Preparation of a building model - The students in batches should prepare and submit a building model for a given plinth area in a given site plan constrained by a boundary wall. The minimum requirements of a residential building viz., drawing cum dining room, one bed room and a kitchen should be included. The concept of an energy efficient building should also be included in the model.

Home assignment 2: Report preparation -The student should collect the construction details of any one unique Civil Engineering structure, prepare and submit a detailed report with neat illustrations.

Home assignment 3: Report preparation - The students should collect samples of building materials, prepare and submit a detailed report including their market rates.

(For braches other than Civil Engineering)

Setting out of a building: The student should set out a building (single room only) as per the

given building plan using tape only.
Setting out of a building: The student should set out a building (single room only) as per the given building plan using tape and cross staff.
Building area computation: The student should prepare a rough sketch of a given single storeyed building and by taking linear measurements compute plinth area and carpet area of the given building.
Construct a wall of atleast a height of 500mm and wall thickness 1brick using English bond (No mortar required) - corner portion – length of side walls at least 600mm.
Compute the area and/or volume of various features of a building/structure such as door and window size, number of bricks required to construct a wall of a building, diameter of bars used in windows etc. – To create an awareness of measurements and units (use tape or other simple measuring instruments like vernier calipers, screw gauge etc.).
Horizontal measurements: Find the area of an irregular polygon set out on the field.
Vertical measurements: Find the level difference between any two points.
Computation of Centre of gravity and Moment of inertia of a given rolled steel section by sketching and measurements.
Home assignment 1: Preparation of a building model - The students in batches should prepare and submit a building model for a given plinth area in a given site plan constrained by a boundary wall. The minimum requirements of a residential building viz., drawing cum dining room, one bed room and a kitchen should be included. The concept of an energy efficient building should also be included in the model.
Home assignment 2: Report preparation - The student should collect the construction details of an industrial building related to their branch of study, prepare and submit a detailed report with neat illustrations.
Home assignment 3: Report preparation - The students should collect samples of building materials, prepare and submit a detailed report about their market rates.

Expected outcome

References:

Course No.	Course Name	L-T-P-Credits	Year of Introduction
ME110	MECHANICAL ENGINEERING WORKSHOP	0-0-2-1	2015

Course Objectives

Introduction to manufacturing process and their applications. Familiarization of various tools, measuring devices, practices and machines used in various workshop sections

List of Exercises / Experiments (Minimum of 8 mandatory)

Sl. No.	Name of Shop floor	Exercises	No of sessions
1	General	Studies of mechanical tools, components and their applications: (a) Tools: Screw drivers, spanners, allen keys, Cutting pliers etc. And accessories (b)Components: Bearings, seals, O-rings, circlips, keys etc.	1
2	Carpentry	Any one model from the following: 1. T-Lap joint 2. Cross lap joint 3. Dovetail joint 4. Mortise joint	2
3	Smithy	(a) Demonstrating the forgability of different materials (MS, Al, Alloy steel and Cast steel) in cold and hot states. (b) Observing the qualitative differences in the hardness of these materials (c) Determining the shape and dimensional variations of Al test specimen due to forging under different states by visual inspection and measurements	2
4	Foundry	Any one exercise from the following 1.Bench moulding 2. Floor mouldiing 3. Core making	2
5	Sheet metal	Any one exercise from the following Making 1. Cylindrical 2. Conical 3. Prismatic shaped jobs from sheet metal	2
6	Welding	Any one exercise from the following Making joints using Electric arc welding. Bead formation in horizontal, vertical and overhead positions	2
7	Fitting and Assembly	Filing exercise and any one of the following exercises Disassembling and reassembling of 1. cylinder piston assembly 2. Tail stock assembly 3. Time piece/clock 4. Bicycle or any machine.	2
8	Machines	Demonstration and applications of Drilling machine, Grinding machine, Shaping machine, Milling machine and lathe	2

Expected outcome

References:

Course No.	Course Name	L-T-P-Credits	Year of Introduction
EE110	ELECTRICAL ENGINEERING WORKSHOP	0-0-2-1	2015

Course Objectives

The objective of this course is to set a firm and solid foundation in Electrical Engineering with strong analytical skills and conceptual understanding of basic laws and analysis methods in electrical and magnetic circuits.

List of Exercises / Experiments (Minimum of 8 mandatory)

1. Identify different types of cables/wires and switches and their uses.
2. Identify different types of fuses & fuse carriers, MCB and ELCB, MCCB with ratings and usage.
3. Wiring of simple light circuit for controlling light/fan point (PVC conduit wiring).
4. Wiring of light/fan circuit using Two way switches (Staircase wiring)
5. Wiring of fluorescent lamps and light sockets (6 A)
6. Wiring of Power circuit for controlling power device (16A socket)
7. Godown wiring / Tunnel wiring
8. Wiring of power distribution arrangement using single phase MCB distribution board with ELCB, Main switch and Energy meter.
9. Measurement of voltage, current, resistance, inductance, and capacitance in a given RLC circuit using LCR meter and Multimeter.
10. Measurement of voltage, current and power in single phase circuit using voltmeter, ammeter and wattmeter. Calculate the power factor of the circuit.
11. Wiring of backup power supply including inverter, battery and load.
12. Demonstration of electric iron, mixer grinder, single phase pump, exhaust fan.

Expected outcome

1. Familiarity with supply arrangements and their limitations, knowledge of standard voltages and their tolerances, safety aspects of electrical systems and importance of protective measures in wiring systems.
2. Knowledge about the types of wires, cables and other accessories used in wiring. Creating awareness of energy conservation in electrical systems.
3. Students should be able to wire simple lighting circuits for domestic buildings, distinguish between light and power circuits.
4. To measure electrical circuit parameters and current, voltage and power in a circuit. Familiarity with backup power supply in domestic installation.

References:

Course No.	Course Name	L-T-P-Credits	Year of Introduction
EC110	ELECTRONICS ENGINEERING WORKSHOP	0-0-2-1	2015

Course Objectives

This course gives the basic introduction of electronic hardware systems and provides hands-on training with familiarization, identification, testing, assembling, dismantling, fabrication and repairing such systems by making use of the various tools and instruments available in the Electronics Workshop.

List of Exercises / Experiments (Minimum of 8 mandatory)

1. Familiarization/Identification of electronic components with specification (Functionality, type, size, colour coding, package, symbol, cost etc. [Active, Passive, Electrical, Electronic, Electro-mechanical, Wires, Cables, Connectors, Fuses, Switches, Relays, Crystals, Displays, Fasteners, Heat sink etc.)
2. Drawing of electronic circuit diagrams using BIS/IEEE symbols and introduction to EDA tools, Interpret data sheets of discrete components and IC's, Estimation and costing.
3. Familiarization/Application of testing instruments and commonly used tools. [Multimeter, Function generator, Power supply, CRO etc.] [Soldering iron, De-soldering pump, Pliers, Cutters, Wire strippers, Screw drivers, Tweezers, Crimping tool, Hot air soldering and de-soldering station etc.]
4. Testing of electronic components [Resistor, Capacitor, Diode, Transistor, UJT and JFET using multimeter.]
5. Inter-connection methods and soldering practice. [Bread board, Wrapping, Crimping, Soldering - types - selection of materials and safety precautions, soldering practice in connectors and general purpose PCB, Crimping.]
6. Printed circuit boards (PCB) [Types, Single sided, Double sided, PTH, Processing methods, Design and fabrication of a single sided PCB for a simple circuit with manual etching (Ferric chloride) and drilling.]
7. Assembling of electronic circuit/system on general purpose PCB, test and show the functioning(**Any Four circuits)**
    1. Fixed voltage power supply with transformer, rectifier diode, capacitor filter, zener/IC regulator.
    2. LED blinking circuit using a stable multi-vibrator with transistor BC 107.
    3. Square wave generation using IC 555 timer in IC base.
    4. Sine wave generation using IC 741 OP-AMP in IC base.
    5. RC coupled amplifier with transistor BC 107.
    6. AND and NAND gates in diode transistor logic.

8.Familiarization of electronic systems (**Any three systems)**

1. Setting up of a PA system with different microphones, loud speakers, mixer etc.
2. Assembling and dismantling of desktop computer/laptop/mobile phones.
3. Coil/Transformer winding.
4. Identify the subsystems of TV, DTH, CCTV, Cable TV, CRO, Function generator etc.
5. Screen printing and PCB pattern transfer
6. Soldering & de-soldering of SMD using hot air soldering station.
7. Introduction to robotics- Familiarization of components (motor, sensors, battery etc.) used in robotics and assembling of simple robotic configurations.

Expected outcome

Student can identify the active and passive electronic components. Student gets hands-on assembling, testing, assembling, dismantling, fabrication and repairing systems by making use of the various tools and instruments available in the Electronics Workshop.

References Books:

Course No.	Course Name	L-T-P-Credits	Year of Introduction
CS110	COMPUTER SCIENCE WORKSHOP	0-0-2-1	2015

Course Objectives

1. To familiarize students with basic hardware and software tools
2. To implement algorithms studied in the course Introduction to Computing & Problem Solving.
3. To learn the implementation of control structures, Iterations and recursive functions, Lists, Tuples and Dictionaries.
4. To implement operations of files.
5. To implement a small micro project using Python

List of Exercises / Experiments (Minimum of 8 mandatory)

List of Exercises:

Introduction: Familiarization of hardware components of a desktop computer (motherboard, cards, memory, slots, power, cables etc.) Familiarization of Operating systems and various tools, particularly those for scientific computing, open source tools etc.

Programming exercises in Python based on the course Introduction To Computing and Problem Solving (BE 101-05). The exercises may include programs using the following concepts–

1. **Decision making, branching and looping**
    1. Variables , Expressions &Conditional statements
    2. Iteration statements (While , For etc)
2. **Function & Function calls**
    1. Function calls, Math functions
    2. Parameters and arguments
    3. Adding new functions, Recursion
3. **Strings**
    1. String traversal
    2. String searching, Comparison
    3. Other important String methods

4. **Lists, Tuples and Dictionaries**

   1. Traversing List, List Operations
   2. Creation of Dictionary and Operations
   3. Lists and Tuples

5. **Files and Operations**

   1. Files - defining, opening/closing, operations
   2. Pickling

6. **Micro Project**: Students are expected to do a micro project by using Python, preferably related to the Web

Expected outcome

1. Students are able to identify common hardware components and their purpose
2. Students gain sufficient awareness about latest software tools.
3. Students are able to develop programs in Python for common problems of reasonable complexity.

References:

Course No.	Course Name	L-T-P-Credits	Year of Introduction
CH110	CHEMICAL ENGINEERING WORKSHOP	0-0-2-1	2015

Course Objectives

To impart in students the basic knowledge in chemical engineering through simple experiments and demonstrations.

List of Exercises / Experiments (Minimum of 8 mandatory)

1. Preparation of soap
2. Determination of flash and fire point
3. Preparation of Biodiesel
4. Specific gravity measurement
5. Fabrication of FRP laminates/ Study of filtration equipments
6. Study of distillation column
7. Study of absorption column
8. Study of heat exchanger
9. Study of size reduction equipments
10. Preparation of Pigment

Expected outcome

Students will have a thorough understanding of the basic concepts that they learn in the theory paper “Introduction to Chemical Engineering”.

References: