MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WB
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Syllabus for B. Sc. In Robotics& 3D Printing (In-house)
(Effective for Students Admitted in Academic Session 2019-2020)

<u>Semester-I</u>

DETAILED SYLLABUS

Communicative English

Code: RB-HU 101
Contact: 3L
Credits: 2
Allotted Hrs: 36

Detailed contents

Unit I: Grammar:

Correction of sentence, Vocabulary / word formation, Single word for a group of words,

Fill in the blank, transformation of sentences, Structure of sentences – Active / Passive

Voice – Direct / Indirect Narration

Unit II:

Essay – Descriptive – Comparative – Argumentative – Thesis statement- Structure of opening

/ concluding paragraphs – Body of the essay

Unit III:

Reading Comprehension – Global – Contextual – Inferential – Select passages from
recommended text

Unit IV:

Business Correspondence – Letter Writing – Formal.Drafting.Biodata- Resume′-

Curriculum Vitae

Unit V:

Report Writing – Structure , Types of report – Practice Writing

Unit VI:

Communication / Public Speaking skills , Features of effective speech, verbal-nonverbal

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Unit VII:

Group discussion – principle – practice

Course Outcomes:

Participate effectively in informal conversations; introduce themselves and their friends and express opinions in English.

• Comprehend conversations and short talks delivered in English

• Write short essays of a general kind and personal letters and emails in English

Reference Books:

1. Mark MaCormack : "Communication"

2. John Metchell" How to write reports"

3. S R Inthira& V Saraswathi" Enrich your English – a) Communication skills b)

Academic

skills " Publisher CIEFL & OUP

4. R.C. Sharma and K.Mohan , "Business Correspondence and Report Writing " , Tata

McGraw Hill , New Delhi , 1994

5. L.Gartside , "Model Business Letters" , Pitman , London , 1992

6. Longman , "Longman Dictionary of Contemporary English" (or 'Oxford Advanced

Learner's Dictionary of Current English' , OUP , 1998.

7. Maxwell Nurnberg and RosenblumMorris , "All About Words" , General Book Depot,

New Delhi , 1995

8. A Text Book for English foe Engineers & Technologists

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ENGINEERING MATHEMATICS I

Code:RB-M 101
Contact: 3L+1T
Credits: 3
Allotted Hrs: 36

Detailed contents

UNIT I: Modern algebra

Binary Operation; Addition Modulo n; Multiplication modulo n; semi group; properties of groups; subgroup.

UNIT II: Trigonometry

Radian or circular Measure; Trigonometric Functions; Trigonometric ratios of angle θ when θ is acute; trigonometric ratios of certain standard angles; allied angles; compound angles; multiple and sub- multiple angles.

UNIT III: Limits and Continuity

The real number system; The concept of limit; concept of continuity.

UNIT IV: Differentiation

Differentiation of powers of x; Differentiation of ex and log x; differentiation of trigonometric functions; Rules for finding derivatives; Different types of differentiation; logarithmic differentiation; differentiation by substitution; differentiation of implicit functions; differentiation from parametric equation. Differentiation from first principles.

UNIT V: Integrations

Integration of standard Functions; rules of Integration; More formulas in integration; Definite integrals.

UNIT VI: Differential equations

First order differential equations; practical approach to Differential equations; first order and first degree differential equations; homogeneous equations. Linear equations;

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Bernoulli's equation; Exact Differential Equations.

UNIT VII: Complex Numbers

Complex Numbers; Conjugate of a complex number; modulus of a complex

Number; geometrical representation of complex number; De Moivere's theorem;

nthroots of a complex number.

UNIT VIII: Matrices and Determinants

Definition of a matrix; Operations on matrices; Square Matrix and its inverse;

Department of Information Technology

determinants; properties of determinants; the inverse of a matrix; solution of equations

using matrices and determinants; solving equations using determinants.

UNIT IX: Infinite Series

Convergence and divergence; series of positive terms; binomial series; exponential

series;logarithmic series.

UNIT X: Probability

Concept of probability; sample space and events; three approaches of probability;

kolmogorov's axiomatic approach to probability; conditional probability and

independence of events; bay's theorem.

UNIT XI: Basics Statistics

Measures of central Tendency; Standard Deviation; Discrete series. Methods; Deviation

taken from assumed mean; continuous series; combined standard deviation; coefficient

of variation; variance.

Reference Books:

1. Banerjee A., De S.K. and Sen S.: Mathematical Probability, U.N. Dhur& Sons.

2. Gupta S. C and Kapoor V K: Fundamentals of Mathematical Statistics, Sultan Chand

& Sons.

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Engineering Mechanics

Code: RBMS 101

Contact hours/week: 3L+1T

Credits: 3

OBJECTIVES:
☐ To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering.

UNIT I STATICS OF PARTICLES   9+6
Introduction – Units and Dimensions – Laws of Mechanics – Lami's theorem, Parallelogram and triangular Law of forces – Vectorial representation of forces – Vector operations of forces -additions, subtraction, dot product, cross product – Coplanar Forces – rectangular components – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility .

UNIT II EQUILIBRIUM OF RIGID BODIES   9+6
Free body diagram – Types of supports –Action and reaction forces –stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Single equivalent force -Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions

UNIT III PROPERTIES OF SURFACES AND SOLIDS   9+6
Centroids and centre of mass – Centroids of lines and areas - Rectangular, circular, triangular areas by integration – T section, I section, - Angle section, Hollow section by using standard formula –Theorems of Pappus - Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Principal moments of inertia of plane areas – Principal axes of inertia-Mass moment of inertia –mass moment of inertia for prismatic, cylindrical and spherical solids from first principle – Relation to area moments of inertia.

UNIT IV DYNAMICS OF PARTICLES   9+6
Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion - Newton's laws of motion – Work Energy Equation– Impulse and Momentum – Impact of elastic bodies.

UNIT V FRICTION AND RIGID BODY DYNAMICS   9+6
Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction –wedge friction-. Rolling resistance -Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.
TOTAL : 45+30=75 PERIODS

OUTCOMES:
On successful completion of this course, the student will be able to
☐ illustrate the vectorial and scalar representation of forces and moments
☐ analyse the rigid body in equilibrium
☐ evaluate the properties of surfaces and solids
☐ calculate dynamic forces exerted in rigid body

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☐ determine the friction and the effects by the laws of friction

TEXT BOOKS:
1. Beer, F.P and Johnston Jr. E.R., "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 8th Edition, Tata McGraw-Hill Publishing company, New Delhi (2004).
2. Vela Murali, "Engineering Mechanics", Oxford University Press (2010)

REFERENCES:
1. Bhavikatti, S.S and Rajashekarappa, K.G., "Engineering Mechanics", New Age International (P) Limited Publishers, 1998.
2. Hibbeller, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 11th Edition, Pearson Education 2010.
3. Irving H. Shames and Krishna Mohana Rao. G., "Engineering Mechanics – Statics and Dynamics", 4th Edition, Pearson Education 2006.
4. Meriam J.L. and Kraige L.G., " Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2", Third Edition, John Wiley & Sons,1993.
5. Rajasekaran S and Sankarasubramanian G., "Engineering Mechanics Statics and Dynamics", 3rd Edition, Vikas Publishing House Pvt. Ltd., 2005.

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ENGINEERING PHYSICS

Course Code: RB-PH101
Course Title: Physics-I Semester : First
L-T-P : 3-1-0 Credit: 2
Pre-Requisites:

Course objectives:

Basic concepts of mechanics, optics and its applications, electricity, magnetism and qualitative

understanding of concepts of quantum physics and statistical mechanics.

1. Mechanics (7L)

Problems including constraints & friction. Basic ideas of vector calculus and partial

differential equations. Potential energy function F = -grad V, equipotential surfaces and meaning

of gradient. Conservative and non-conservative forces. Conservation laws of energy & momentum.

Non-inertial frames of reference. Harmonic oscillator; Damped harmonic motion forced

oscillations and resonance. Motion of a rigid body in a plane and in 3D. Angular velocity vector.

Moment of inertia.

2. Optics (5L)

· Distinction between interference and diffraction, Fraunhofer and Fresnel diffraction, Fraunhofer diffraction at single slit, double slit, and multiple slits (only the expressions for max;min, & intensity and qualitative discussion of fringes); diffraction grating(resolution formulac only), characteristics of diffration grating and its applications.

· Polarisation : Introduction, polarisation by reflection, polarisation by double reflection, scattering of light, circular and elliptical polarisation, optical activity.

· Lasers : Principles and working of laser : population inversion, pumping, various modes, threshold

population inversion with examples .

3. Electromagnetism and Dielectric Magnetic Properties of Materials (8L)

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· Maxwell's equations. Polarisation, permeability and dielectric constant, polar and non-polar

dielecrrics, internal fields in a solid, Clausius- Mossotti equation(expression only), applications of

dielectrics.

· Magnetisation , permeability and susceptibility, classificationof magnetic materials, ferromagnetism,

magnetic domains and hysteresis, applications.

4. Quantum Mechanics (16L)

· Introduction to quantum physics, black body radiation, explanation using the photon concept,

Compton effect, de Broglie hypothesis, wave-particle duality, verification of matter waves,

uncertainty principle, Schrodinger wave equation, particle in box, quantum harmonic oscillator,

hydrogen atom.

5. Statistical Mechanics (8L)

· Macrostate, Microstate, Density of states, Qualitative treatment of Maxwell Boltzmann, Fermi-Dirac and Bose-Einstein statistics.

Course outcomes:

Students will be familiar with

· Basic concepts of mechanics

· Bragg's Law and introduction to the principles of lasers, types of lasers and applications.

· Various terms related to properties of materials such as, permeability, polarization,etc.

· Some of the basic laws related to quantum mechanics as well as magnetic and dielectric properties of materials.

· Simple quantum mechanics calculations.

Learning Resources:

1. Introduction to Electrodynamics, David J. Griffiths, Pearson Education India

Learning Private Limited

2. Principles of Physics, 10ed, David Halliday, Robert Resnick Jearl Walker , Wiley

3. Electricity, Magnetism, and Light, Wayne M. Saslow, Academic Press

4. Engineering Mechanics (In SI Units) (SIE), S. Timoshenko, D.H. Young,

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J.V. Rao, Sukumar Pati , McGraw Hill Education

5. Classical mechanics, Narayan Rana, Pramod Joag, McGraw Hill Education

6. Introduction to Classical Mechanics, R Takwale, P Puranik, McGraw Hill Education

7. Engineering Mechanics, M.K. Harbola , Cengage India

8. An Introduction to Mechanics (SIE), David Kleppner, Robert Kolenkow, McGraw Hill Education

9. Principles of mechanics, John L. Synge and Byron A. Griffith, New York, McGraw-Hill

10. Mechanics (Dover Books on Physics) , J. P. Den Hartog , Dover Publications Inc.

11. Engineering Mechanics: Dynamics, L.G. Kraige J.L. Meriam, Wiley

12. Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles,

Robert Eisberg, Robert Resnick, Wiley

13. Introduction to Quantum Mechanics, J. Griffiths David , Pearson

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ENGINEERING CHEMISTRY

Course Code : RB-CH 101
Course Title : Chemistry-I Semester : First
L-T-P : 3-1-0 Credit:2
Pre-Requisites:

Detailed contents

i) Atomic and molecular structure (10 lectures)

Schrodinger equation. Particle in a box solutions and their applications for simple sample. Molecular orbitals

of diatomic molecules (e.g.H_2). Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and

benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their

magnetic properties. Band structure of solids and the role of doping on band structures.

ii) Spectroscopic techniques and applications (8 lectures)

Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in

medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic

resonance and magnetic resonance imaging, surface characterisation techniques. Diffraction and scattering.

iii)Intermolecular forces and potential energy surfaces (4 lectures)

Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena.

iv) Use of free energy in chemical equilibria (8 lectures)

First and second laws of thermodynamics and thermodynamic functions: energy, entropy and free energy.

Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and

applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free

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energy considerations in metallurgy through Ellingham diagrams.

v) Periodic properties (4 Lectures)

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the

periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and

electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries

vi) Stereochemistry (4 lectures)

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations

And symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and

conformational analysis. Isomerism in transitional metal compound.

vii) Organic reactions and synthesis of a drug molecule (4 lectures)

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and

ring openings. Synthesis of a commonly used drug molecule.

Course Outcomes

The concepts developed in this course will aid in quantification of several concepts in chemistry that have

been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic,

atomic and molecular level modifications. Quantum theory is more than 100 years old and to understand

phenomena at nanometer levels, one has to base the description of all chemical processes at molecular levels.

The course will enable the student to:

· Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces. ·

· Rationalise bulk properties and processes using thermodynamic considerations. ·

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· Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy

levels in various spectroscopic techniques ·

· Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and

electronegativity. ·

· List major chemical reactions that are used in the synthesis of molecules. ·

Learning Resources:

1. Engineering Chemistry, Satyaprakash, Khanna Book Publishing, Delhi

2. University chemistry, by B. H. Mahan

3. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane

4. Fundamentals of Molecular Spectroscopy, by C. N. Banwell

5. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan

6. Physical Chemistry, by P. W. Atkins

7. Spectroscopy of Organic Compounds, by P.S.Kalsi, New Age International Pvt Ltd Publishers

8. Physical Chemistry, P. C. Rakshit, Sarat Book House

9. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition

http://bcs.whfreeman.com/vollhardtschore5e/default.asp

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BASIC ELECTRICAL & ELECTRONICS ENGINEERING

Paper Name: Electrical & Electronics Engineering
Code: RB-EE 101
Contact: 3L+1T
Credits: 3
Allotted Hrs: 36

Detailed contents

Unit I: ELECTRICAL CIRCUITS & MEASUREMENTS

Fundamental laws of electric circuits, Steady State Solution of DC Circuits –

Introduction to AC Circuits -Sinusoidal steady state analysis, Power and Power factor -

Single Phase and Three Phase Balanced Circuits. Classification of instruments -

Operating Principles of indicating Instruments

Unit II: ELECTRICAL MACHINES

Construction, Principle of Operation, Basic Equations and Applications of DC

Generators, DC Motors, Single Phase Transformer, single phase induction Motor.

Unit III: SEMICONDUCTOR DEVICES AND APPLICATIONS

Introduction - Characteristics of PN Junction Diode – Zener Effect - Zener Diode and its

Characteristics - Half wave and Full wave Rectifiers - Voltage Regulation. Bipolar

Junction Transistor - CB, CE, CC Configurations and Characteristics - Elementary

Treatment of Small Signal Amplifier.

Unit IV: DIGITAL ELECTRONICS

Binary Number System – Boolean algebra theorems, Digital circuits - Introduction to

sequential Circuits, Flip-Flops - Registers and Counters – A/D and D/A Conversion -

digital processing architecture.

Unit V: FUNDAMENTALS OF COMMUNICATION ENGINEERING

Introduction - Elements of Communication Systems, Modulation and Demodulation:

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Principles of Amplitude and Frequency Modulations. Digital Communication -

Communication Systems: Radio, Antenna, TV, Fax, ISDN, Microwave, Satellite and

Optical Fibre (Block Diagram Approach only).

Reference Books:

1. DP Kothari and 1.J Nagarath, "Electrical Machines "Basic Electrical and Electronics

Engineering", McGraw Hill Education(India) Private Limited, Third Reprint,2016

2. S.K. Bhattacharya "Basic Electrical and Electronics Engineering", Pearson India,

2011

3. Sedha R.S., "Applied Electronics", S. Chand & Co., 2006

4. A.E.Fitzgerald, David E Higginbotham and Arvin Grabel, "Basic Electrical

Engineering",

McGraw Hill Education(India) Private Limited, 2009

5. Del Toro, "Electrical Engineering Fundamentals", Pearson Education, New Delhi,

2007

6. "Foundations of Electrical Engineering", Oxford University Press, 2013

7. MahmoodNahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline

Series,

McGraw Hill, 2002.

8. Mehta V K, "Principles of Electronics", S.Chand& Company Ltd, 1994.

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PROBLEM SOLVING AND PYTHON PROGRAMMING

Code: RB-CS 191
Contact: 1L+3P
Credits: 1.5

UNIT I ALGORITHMIC PROBLEM SOLVING 9

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT II DATA, EXPRESSIONS, STATEMENTS 9

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III CONTROL FLOW, FUNCTIONS 9

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV LISTS, TUPLES, DICTIONARIES 9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, histogram.

UNIT V FILES, MODULES, PACKAGES 9

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

OUTCOMES:

Upon completion of the course, students will be able to

☐ Develop algorithmic solutions to simple computational problems

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☐ Read, write, execute by hand simple Python programs.

☐ Structure simple Python programs for solving problems.

☐ Decompose a Python program into functions.

☐ Represent compound data using Python lists, tuples, dictionaries.

☐ Read and write data from/to files in Python Programs.

TEXT BOOKS:

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think-python/)
2. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

REFERENCES:

1. John V Guttag, "Introduction to Computation and Programming Using Python'', Revised and expanded Edition, MIT Press , 2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
3. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd.,, 2015.
4. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
5. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
6. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers, LLC, 2013.

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Engineering Graphics

Code: RB-MS191

Contact Hours/Week: 3P

Credits: 1.5

Sl. No.	Content	Lecture (L)	Practical (P)
1	**INTRODUCTION TO ENGINEERING DRAWING** Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Different types of lines and their use; Drawing standards and codes.	1	4
2	**LETTERING, DIMENSIONING, SCALES** Plain scale, Diagonal scale and Vernier Scales.	1	4
3	**GEOMETRICAL CONSTRUCTION AND CURVES** Construction of polygons, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid, Involute, Archemedian Spiral.	1	4
4	**PROJECTION OF POINTS, LINES, SURFACES** Principles of Orthographic Projections-Conventions - 1st and 3rd angle projection, Projections of Points and lines inclined to both planes; Projections of planes (Rectangle, pentagon, Hexagon etc.) inclined Planes - Auxiliary Planes.	1	4
5	**PROJECTION OF REGULAR SOLIDS** Regular solids inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale (Cube, Pyramid, Prism, Cylinder, Cone).	1	4
6	**COMBINATION OF REGULAR SOLIDS, FLOOR PLANS** Regular solids in mutual contact with each other like Spheres in contact with cones standing on their base. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.	1	4
7	**ISOMETRIC PROJECTIONS** Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;	1	4

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8	**SECTIONS AND SECTIONAL VIEWS OF RIGHT ANGULAR SOLIDS** Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)	1	4
9	**OVERVIEW OF COMPUTER GRAPHICS**, C**USTOMISATION& CAD DRAWING** listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids]; Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;	1	4
10	**ANNOTATIONS, LAYERING & OTHER FUNCTIONS** applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer- aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and	2	8

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	two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multiview, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling;		
11	**DEMONSTRATION OF A SIMPLE TEAM DESIGN PROJECT** Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid- modeling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).	2	8

Course Outcomes

The student will learn:

- Introduction to engineering design and its place in society
- Exposure to the visual aspects of engineering design
- Exposure to engineering graphics standards
- Exposure to solid modelling

General Instructions

1. In every topic some problems are to be done in the class and some are to be given to students as home assignment.

2. The problems for class work are to be prepared on drawing sheet of A1 size in the class/ using AutoCAD software.

3. The problems for home assignments are to be prepared on drawing copy/ using AutoCAD software.

4. Print out of every assignment is to be taken for CAD Drawings on Drawing sheets (A4 Sheets).

5. A title block must be prepared in each sheet/ assignment.

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(Effective for Students Admitted in Academic Session 2019-2020)

Following is the list of drawing instruments that required for making engineering drawings on paper with perfection.

1. Drawing Board
2. Mini drafter/ Set-squares (45°–45° & 60°–
90°), T-square 3.   Protractor (180°, 360°)
4. Scales (Plain, Diagonal)
5. Compass (Small and Large)
6. Divider (Small and Large)
7. French Curves
8. Drawing paper (A1 Size)
9. Drawing pencil (H, HB, B)
10. Sharpener
11. Eraser
12. Drawing pins & clips
13. Duster or handkerchief etc.

Learning Resources:

1. Pradeep Jain, Ankita Maheswari, A.P. Gautam, Engineering Graphics & Design, Khanna Publishing House

2. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House

3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication

4. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education

5. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers

6. Corresponding set of CAD Software Theory and User Manuals

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Basic Electrical & Electronics Lab
Code: RB-EE191
Contact Hours/Week: 3P
Credits: 2

OBJECTIVE:

• To train the students in performing various tests on electrical drives, sensors and circuits.

LIST OF EXPERIMENTS:

1. Load test on separately excited DC generator

2. Load test on Single phase Transformer

3. Load test on Induction motor

4. Verification of Circuit Laws

5. Verification of Circuit Theorems

6. Measurement of three phase power

7. Load test on DC shunt motor.

8. Diode based application circuits

9. Transistor based application circuits

10. Study of CRO and measurement of AC signals

11. Characteristics of LVDT

12. Calibration of Rotometer

13. RTD and Thermistor

Minimum of 10 Experiments to be carried out :- TOTAL: 60 PERIODS

OUTCOMES:

• Ability to determine the speed characteristic of different electrical machines

• Ability to design simple circuits involving diodes and transistors

• Ability to use operational amplifiers