



JSPM's
RAJARSHI SHAHU COLLEGE OF ENGINEERING
TATHAWADE, PUNE-33
(An Autonomous Institute Affiliated to Savitribai Phule Pune University,
Pune)



Department of Engineering Sciences
Structure & Syllabi
F.Y. B. Tech (2019 Pattern)



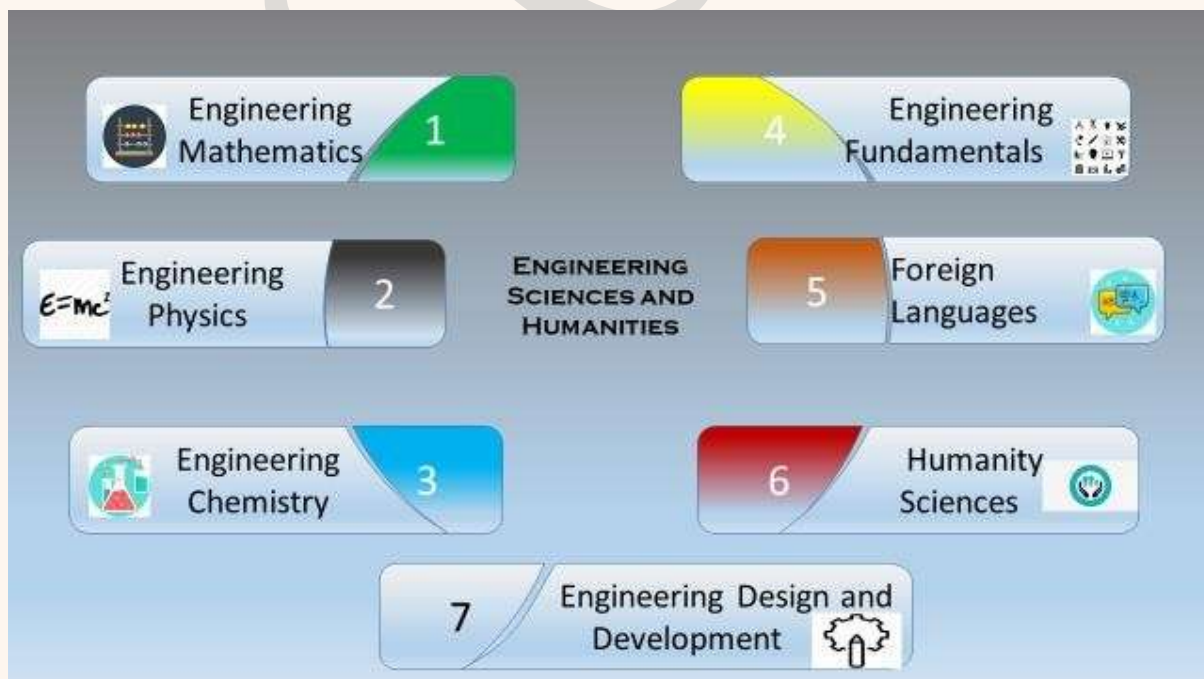
DEPARTMENT OF F.Y.B.TECH ENGINEERING

Vision

To satisfy the aspirations of youth force, who wants to lead nation towards prosperity through techno-economic development.

Mission

To provide, nurture and maintain an environment of high academic excellence, research and entrepreneurship for all aspiring students, which will prepare them to face global challenges maintaining high ethical and moral standards.



Dr. S M Yadav
H.O.D, Engg. Science

Dr. S V Kedar
Dean Academics



Dr. R. K. Jain
Director RSCOE, Pune



DEPARTMENT OF F.Y.B.TECH
Program Outcomes (POs)

- 1. Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem Analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.
- 5. Modern Tool usage:** Create, select and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- 6. The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11. Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- 12. Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological challenges.

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DEPARTMENT OF F.Y.B.TECH

Highlights of the Syllabus

Curriculum of F. Y. B. Tech Department is designed in consultation with experts like:



Academic
Experts



Industry/Corporate
Experts



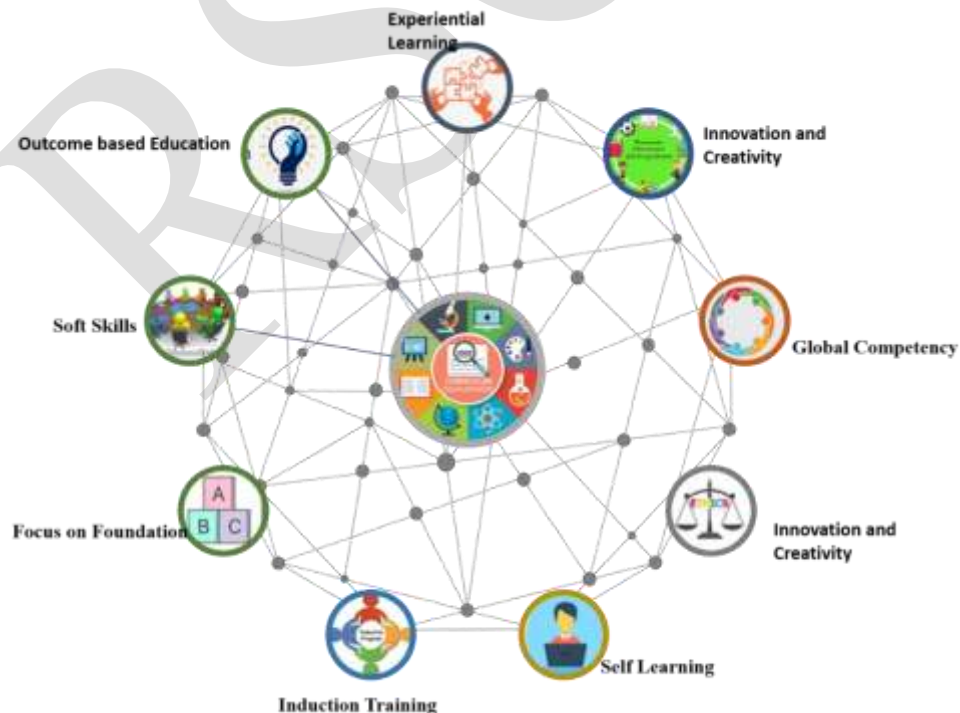
Distinguished
Alumni

The curriculum of the F.Y.B. Tech comprises of three groups and designed in association with the Tata Consultancy Services, Pune, IIT Ropar, KPIT (Automotive Electronics), Bentley System and Persistent Systems Pvt. Ltd. Pune.

Group 1: Civil Engineering, Mechanical Engineering, Electronics and Telecommunication Engineering and Electrical Engineering.

Group 2: Computer Engineering

Group 3: Information and Technology Engineering



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Unique features of the curriculum:

- 1. Curriculum centered at Outcome Based Education:** The new curriculum is focused on **student-centered instruction models** that concentrate on evaluating student success by outcomes. The outcomes include topic awareness, industry required skills and attitude.
- 2. Foundation Courses:** The **Basic Science** subjects and **Fundamental Engineering** subjects are pivotal for Engineering Education. These courses are structured in the sense of implementing the respective streams with a more realistic approach.
- 3. Contemporary Curriculum:** Curriculum focuses on learning using **modern tools and technologies** such as Survey using Unmanned Aerial Vehicle: drone, robotics, biomedical engineering, CAD latest apps, hands-on experience on 3D printing technology and CNC / VMC machine, conceptualization of recent **Education 4.0** trends like Machine Learning, AI, Data Science
- 4. Induction Training:** It's a well-planned three-week event to **acquaint** new aspirants about the atmosphere in the organization, connect them with the people in it, help themselves to unfold and get settled with an innocuous everyday routine. Training will also gain awareness, sensitivity and perception of oneself, individuals around them, society at large, and nature.
- 5. Engineering Design and Development: Experiential learning** is the main aspect in information gain by experience. This gives students the opportunity to collaborate or develop their own learning skills, such as problem solving, critical thinking and time management, which exploit the advantages of modern techniques to solve real-world problems using **Problem Based Learning pedagogy (PBL)**.
- 6. Self-Learning:** The curriculum provides students the **flexibility** to take initiatives satisfy their learning needs with the support of online learning platforms such as MOOCs, NPTEL, Swayam, MHRD, etc.
- 7. Global Competence:** Curriculum aims to build **cognitive skills** that enable access to opportunities for personal and professional development. Foreign language training like English, German, Japanese and French enable to gain insight into the problems and solutions that arise from **different cultures**.
- 8. Blend of Curricular and Extra-Curricular Activities:** The curriculum has a good blend of activities like co-curricular, extra-curricular, sports, culture etc. for the **overall development** of students.
- 9. Inculcating Ethics and Values:** The curriculum included attempts to target **ethics and values** in order to improvise student conduct, helping them make the right choices, lead their professional lives and become ethical individuals.
- 10. Internship Program:** The program involves internships with the goal of acquiring various **discipline-related skills and technologies** and developing their technical and professional knowledge.



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Structure for Group-1(Mechanical, Civil, E&TC &Electrical)

F. Y. B. Tech

Academic Year -2020-2021 Semester -I

Course Code	Course	Teaching Scheme			Semester Examination Scheme of Marks					Total	Credits
		TH	Tut	Lab	Theory			Practical			
					ISE (15)	MSE (25)	ESE (60)	TW	Lab		
ES1101	Engineering Mathematics I	3	1	-	15	25	60	25	-	125	4
ES1102 / ES1103	Engineering Physics / Engineering Chemistry	3	-	2	15	25	60	-	25	125	4
CE1101 / CE1102	Basic Civil and Environmental Engineering / Engineering Mechanics	3	-	2	15	25	60	-	25	125	4
ME1101 / ME1102	Engineering Drawing and Computer Aided Graphics / Basic Mechanical and Robotics Engineering	3	-	2	15	25	60	-	25	125	4
EE1101 / EC1101	Basic Electrical Engineering / Basic Electronics and Bio Medical Engineering	3	-	2	15	25	60	-	25	125	4
CS1101	Introduction to Computer Programming	-	1	2	-	-	-	25	25	50	2
ES 1104 HS1101 / HS1102/ HS1103 / HS1104	Engineering Design and Development# OR Language Proficiency-I English/ German/ Japanese/ French	-	-	2	-	-	-	-	25	25	1
HS1108	Induction Training\$	Non Credit									
Total		15	2	12	75	125	300	50	150	700	23

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Structure for Group-1(Mechanical, Civil, E&TC &Electrical)

F. Y. B. Tech.

Academic Year – 2020-2021 Semester –II

Course Code	Course	Teaching Scheme			Semester Examination Scheme of Marks					Total	Credits
		TH	Tut	Lab	Theory			Practical			
					ISE (15)	MSE (25)	ESE (60)	TW	Lab		
ES1105	Engineering Mathematics- II	3	1	-	15	25	60	25	-	125	4
ES1103 / ES1102	Engineering Chemistry / Engineering Physics	3	-	2	15	25	60		25	125	4
CE1102 / CE1101	Engineering Mechanics/ Basic Civil and Environmental Engineering	3	-	-	15	25	60		25	125	4
ME1102/ ME1101	Basic Mechanical and Robotics Engineering / Engineering Drawing and Computer Aided Graphics	3	-	2	15	25	60		25	125	4
EC1101 / EE1101	Basic Electronics and Bio Medical Engineering / Basic Electrical Engineering	3	-	2	15	25	60		25	125	4
CS1102	Introduction to Python Programming	-	1	2	-	-	-	25	25	50	2
ES 1104 OR HS1101 / HS1102 / HS1103 / HS1104	Engineering Design and Development# Language Proficiency-I English/ German/ Japanese / French	-	-	2	-	-	-	-	25	25	1
Total		15	2	12	75	125	300	50	150	700	23

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Instructions:

1. Every student should appear for Engineering Physics, Engineering Chemistry, Basic Electronics Engineering, Basic Electrical Engineering, Basic Mechanical and Robotics Engineering, Engineering Drawing and Computer aided Graphics, Basic Civil and Environmental Engineering and Engineering Mechanics during the year.
2. # Every student should appear for language Proficiency-I and Engineering Design Development (EDD) during the year.
3. \$ For Induction training, the branch wise allocation in a group of 20-22 students is to be formed with one faculty as mentor for each group.
4. ISE, MSE and ESE indicates Internal Semester Evaluation, Mid Semester Evaluation and End Semester Evaluation respectively.

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Syllabus for Group 1 Semester I

Civil Engineering, Mechanical Engineering,
Electronics and Telecommunication Engineering and Electrical
Engineering.



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F. Y. B. Tech (Group 1)
Academic Year – 2020-2021 Semester -I
[ES1101]: Engineering Mathematics-I

Teaching Scheme: TH: - 3 Hours/Week TU:- 1 Hour/Week	Credit TH:3 Tut:1	Examination Scheme: In Sem. Evaluation : 15 Marks Mid Sem. Exam : 25 Marks End Sem. Exam : 60Marks Tutorial : 25Marks
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Course Prerequisites : Determinants and Matrices, Differentiation, Integration, Maxima and Minima.

Course Objective: To familiarize the students with concepts and techniques in Linear algebra, Fourier series and Calculus. The aim is to equip them with the techniques to understand advanced level mathematics and its applications that would enhance thinking power, useful in their disciplines.

Course Outcome:

After successful completion of the course, students will able to learn

- CO1:** The essential tool of matrices and linear algebra in a comprehensive manner for analysis of system of linear equations, finding linear and orthogonal transformations. Eigen values and Eigen vectors applicable to engineering.
- CO2:** Mean value theorems and its generalization leading to Taylor's and Maclaurin's series useful in the analysis of engineering problems.
- CO3:** The technique of Fourier series representation and harmonic analysis for design and analysis of continuous and discrete periodic system.
- CO4:** To deal with partial derivative of functions of several variables that are essential in various branches of engineering.
- CO5:** To apply the concept of Jacobian to find partial derivative of implicit function and functional dependence. Use of partial derivatives in estimating error and approximation and Finding extreme values of the function.

Course Contents

UNIT-I	Linear Algebra-Matrices, System of Linear Equations	8 Hours
Rank of a Matrix, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations, Application to problems in Engineering.		
UNIT-II	Linear Algebra-Eigen Values and Eigen Vectors, Diagonalization	7 Hours
Eigen Values and Eigen Vectors, Cayley Hamilton theorem, Diagonalization of a matrix, Reduction of Quadratic forms to Canonical form by Linear and Orthogonal transformations.		
UNIT-III	Differential Calculus	8 Hours
Rolle's Theorem, Mean Value Theorems, Taylor's Series and Maclaurin's Series, Expansion of functions using standard expansions, Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits and Applications.		

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UNIT-IV	Fourier Series	7 Hours
Definition, Dirichlet's conditions, Full range Fourier series, Half range Fourier series, Harmonic analysis and Applications to problems in Engineering		
UNIT-V	Multivariable Calculus-Partial Differentiation	8 Hours
Introduction to functions of several variables, Partial Derivatives, Euler's Theorem on Homogeneous functions, Partial derivative of Composite Function, Total Derivative, Change of Independent variables.		
UNIT-VI	Applications of Multivariable Calculus	8 Hours
Jacobian and its applications, Errors and Approximations, Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers.		
Guidelines for Tutorial and Term Work		
1) Tutorial for the subject shall be engaged in minimum three batches (batch size of 22 students maximum) per division. 2) Term work shall consist of six assignments on each unit-I to unit-VI and is based on performance and continuous internal assessment.		
Text Books:		
T1. Higher Engineering Mathematics by B. V. Ramana (Tata MacGraw Hill)		
T2. Higher Engineering Mathematics by B.S. Grewal (Henna Publication, Delhi)		
Reference Books:		
R1. Advanced Engineering Mathematics, by Erwin Kreyszig (Wiley Eastern Ltd.)		
R2. Advanced Engineering mathematics by M.D. Greenberg (Pearson Education)		
R3. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil (Thomson Learning)		
R4. Thomas's Calculus-Early Transcendental (Addison- Wesley, Pearson)		
R5. Applied Mathematics (Volume I and II) by P.N. Wartikar and J.N. Wartikar Vidyarathi Griha Prakashan, Pune.		
R6. Linear Algebra –An Introduction, Ron Larson, David C. Falvo. (Cengage Learning, Indian Edition)		



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F. Y. B. Tech (Group 1)
Academic Year – 2020-2021 Semester –I/II

[ES1102]: Engineering Physics

Teaching Scheme: TH: - 3 Hours/Week PR:- 2 Hours/Week	Credit TH: 3 PR:1	Examination Scheme: In Sem. Evaluation: 15 Marks Mid Sem. Exam: 25 Marks End Sem. Exam : 60 Marks Lab Evaluation : 25 Marks
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Course Prerequisites: Physical and Fundamental quantity and its units, Basics of sound, Types of light, State of materials, Semiconductor materials, Magnetism and magnetic moment, Simple harmonic motion, Difference in quantum and classical mechanics and application of Nanotechnology.

Course Objective: The Objective of this course is to make students learn and understand basic concepts and principles of physics to analyze practical engineering problems and apply its solutions effectively and meaningfully. To understand building up of models, design issues, practical oriented skills and problem solving challenges are the great task of the course.

Course Outcome:

After successful completion of the course, students will able to

- CO1:** Apply the knowledge of physics to resolve problems in sound engineering.
- CO2:** Explain the laser operation and interaction of laser with matter and its use in low and high energy application
- CO3:** Explain the classification of materials, band structures, and calculation of carrier density and electrical conductivity
- CO4:** **Explain** classification of solids on the basis of magnetic properties. Discuss the superconducting phenomenon, their properties and concepts for various application
- CO5:** Apply the knowledge of quantum mechanics to study the motion and energy of Particle
- CO6:** Explain difference in between nanoscience and nanotechnology and to understand applications of nano technology.

Course Contents

UNIT-I	Acoustics and ultrasonic's	7 Hours
Introduction,echo,reverberation,reverberationtime,Sabine'sformula,remedies over reverberation, absorption of sound , sound absorbent materials, condition for good acoustics of building, noise, Types of noise remedies over noise .Ultrasonic waves, Production of ultrasonic waves by Piezoelectric oscillator, magnetostriction oscillator, properties of ultrasonic waves, Applications of ultrasonic waves Scientific, Engineering, Nondestructive testing, Medical applications.		
UNIT-II	Laser, fiber optics and optoelectronic devices	7 Hours
MechanismofLaser,LaserProperties,Typesoflasers,Applications:Industry,MedicalandMilitary Optical Fiber, Total Internal Reflection, Acceptance Angle and Cone, Fractional Refractive Index Change, Numerical Aperture, Modes of Propagation, Types of Optical Fibers, Losses in Optical Fiber, Applications: Fiber Optics Communication System.		

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UNIT-III	Solid State Physics	7 Hours
Band Theory of Solids, Classification of Solids, Conductivity of semi-Conductor and Hall Effect, Fermi Level, Fermi Dirac distribution Function, Fermi level in Photo-voltaic Effect, Construction working and I-V characteristics of Solar-cell		
UNIT-IV	Magnetism and Superconductivity	7 Hours
Origin of magnetic moments, magnetization, Langevin's theory of dia and para Magnetism, Curie-Weiss law hysteresis, Introduction to superconductors, Properties superconductors, BCS theory, Types of superconductor, Josephson Effect, Applications of Superconductor.		
UNIT-V	Quantum physics	7 Hours
Wave Particle duality, De-Broglie hypothesis, Heisenberg's uncertainty principle with illustration, applications (non-existence of electron inside the nucleus), Wave function and its physical significance. Schrodinger wave equations, Application of Schrodinger time independent wave equation (particle in a rigid box).		
UNIT-VI	Nanoscience and Nanotechnology	7 Hours
Introduction, Difference between nanoscience and nano technology, Quantum Confinement, Classification of nano structures, Nano scale in, 1D, 2D, 3D, Properties of nanoparticles applications of nanotechnology, and Limitations of nanotechnology.		
Lab Content		
Guidelines for Assessment		
1) Practical for the subject shall be engaged in minimum three batches (batch size of 22 students maximum) per division.		
2) Lab Evaluation is a continuous assessment based on experiments performed, submission of results of experiment in the form of report/journal, timely completion, attendance and understanding.		
List of Laboratory Experiments		
1	Determination of absorption coefficient of sound of given material.	
2	Measurement of sound pressure level	
3	To find a fault / crack in a solid using Echo-Sounding technique	
4	Hall effect experiment	
5	To plot I-V characteristics of solar cell and its fill factor	
6	Determination of Band gap using four-Probe Method	
7	Magnetic susceptibility using Quinines method.	
8	Experiment based on laser	
9	Counting the number of lines in a diffraction grating using laser	
10	Synthesis of gold nanoparticle by colloidal route method.	
Text Books:		
T1. Basic Engineering physics by M. N. Avadhanlu, S CHAND PUBLICATION		
T2. A text of optics by Brij Lal S CHAND PUBLICATION		
T3. Engineering physics: D.K. Bhattacharya and Poonam Tandon.		
T4. An introduction to Laser theory and applications: M N Avadhanlu.		



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Reference Books:

- R1.** Principles of Physics, J. Walker, D. Halliday, R. Resnick, *Wiley Student Edition* (10th Edition)
R2. Fundamentals of Physics, Resnick and Halliday (John Wiley and Sons)
R3. Introduction to Solid State Physics, Kittel C (Wiley and Sons)
R4. Laser and Non-Linear Optics, B.B. Loud (Oscar publication)
R5. Engineering Physics by GaurGupta
R6. Introduction to Nanotechnology, Sulabha Kulkarni.

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F. Y. B. Tech (Group 1)
Academic Year – 2020-2021 Semester -I
[CE1101]: Basic Civil and Environmental Engineering

Teaching Scheme: TH: - 3 Hours/Week PR:- 2 Hours/Week	Credit TH: 3 PR:1	Examination Scheme: In Sem. Evaluation: 15 Marks Mid Sem. Exam : 25 Marks End Sem. Exam : 60 Marks Lab Evaluation : 25 Marks
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Course Prerequisites: Fundamentals of environmental science, basic knowledge of physical quantities with their units.

Course Objective: The main of the objective of this course is to focus on building components, building planning principles, modern tools for surveying knowledge associated with different are as of civil engineering with interdisciplinary approach. Also to make students aware of natural resources, environment protection and sustainability in construction.

Course Outcome:

After successful completion of the course, students will able to:

- CO1 :** Explain role of civil engineers in different areas of civil engineering with interdisciplinary approach.
- CO2 :** Identify different construction materials and components of a structure.
- CO3 :** Make use of modern surveying tools and techniques.
- CO4 :** Utilize various principles of building planning and concept of green building.
- CO5 :** Categories types of energy and environmental pollution.
- CO6 :** Apply concept of environment and the role of civil engineers in sustainable development.

Course Contents

UNIT-I	Introduction to Civil Engineering	7 Hours
Basic Areas in Civil Engineering, Agencies involved in Civil Engineering, Smart city concept. Interdisciplinary approach in Civil Engineering Projects. Data management for infrastructural development like traffic management.		
UNIT-II	Materials and Construction	7 Hours
Basic materials for construction. Recycling of materials, Identification of Eco-friendly materials and Smart materials in construction, Substructure and Superstructure, Earthquake concepts and precautions and construction techniques for earthquake resistance.		
UNIT-III	Surveying	7 Hours
Principles of survey, types of Benchmarks and levelling, Determination of RLs by HI and Rise & Fall method Contours. Introduction to Modern tools and techniques for Surveying; Digital level, Theodolite EDM, Total station, Digital planimeter. Applications of GPS, GIS and Unmanned Aerial Vehicle(UAV)like Drone. Study of land related documents.		
UNIT-IV	Planning for the Built Environment	7 Hours
Principles of planning, concept of Green buildings. Role of by-laws in regulating the environment, Concept of built up area, carpet area, plinth area. Plot area, FSI. Fire safety norms as per NBC.		

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UNIT-V	Energy and Environmental Pollution	7 Hours
Ecosystem, Conventional and non-conventional Energy Sources. Sources, causes, effects and remedial measures of Pollution. Introduction and Disposal methods of Solid waste management and Electronic wastes.		
UNIT-VI	Sustainable Development for Environment protection	7 Hours
Sustainable development. Urbanization and its effects on environment. Environmental ethics, human rights, value education, public awareness, role of modern technology Environmental Impact Assessment (EIA). Concepts of water conservation techniques and its management.		
Lab Content		
Guidelines for Assessment		
1) Practical for the subject shall be engaged in minimum three batches (batch size of 22 students maximum) per division. 2) Lab Evaluation is a continuous assessment based on experiments performed, submission of results of experiment in the form of report/journal, timely completion, attendance and understanding.		
List of Laboratory Experiments		
1	Measurement of distance by Electronics Distance Measurement Instrument (EDMI).	
2	Determination of Area of regular and Irregular plane surface using Digital Planimeter	
3	Global Positioning system (GPS)	
4	Measurement of Reduced Level (R.L.), Height and Distance in the field using Digital Level.	
5	Determination of Reduced Level (R.L.) and Slope analytically between two points on the field using Digital Level.	
6	Introduction to Total Station.	
7	Demonstration of 3D reality modelling using Context Capture Software.	
8	Demonstration of four Civil Engineering software's: Microstation, Open Roads, Water Gems and STAAD Pro	
9	Demonstration of Unmanned Aerial Vehicle (UAV) such as Drone for Surveying.	
10	To present a seminar in a group of four students related to Energy/Environment.	
Text Books:		
T1. Basic Civil and Environmental Engineering by C.P Kaushik, S.S. Bahavikatti, Anubha Kaushik.		
T2. Basic Civil and Environmental Engineering by M.P.Wagh, P.R.Modale, A.H.Shirke, Sharad Pagar.		
Reference Books:		
R1. Basic Civil Engineering by M.S.Palanichamy Tata McGraw Hill publishing Co.Ltd.		
R2. Basic Civil Engineering by Shatheesh Gopi – Pearson.		
R3. Building Construction by Arora S.P. and Bindra S.P. – Dhanpatrai and Sons, Delhi.		
R4. Environmental Studies from Crisis to cure – Oxford Publication, Third edition, 2016.		
R5. Environmental Studies by Dr. J.P. Sharma – University Science Press.		



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F. Y. B. Tech (Group 1)

Academic Year – 2020-2021 Semester -I

[ME1101]: Engineering Drawing and Computer Aided Graphics

Teaching Scheme: TH: - 3 Hours/Week PR:- 2 Hours/Week	Credit TH: 3 PR:1	Examination Scheme: In Sem. Evaluation: 15 Marks Mid Sem. Exam : 25 Marks End Sem. Exam : 60 Marks Lab Evaluation : 25 Marks
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Course Prerequisites: Basic geometrical measurements (linear and angular), Construction and deviation of line, circle and polygon, Co-ordinate geometry, computer literacy.

Course Objective: This course will help students to develop imagination of physical objects to be represented on paper for engineering communication, manual drawing skills and drawing interpretation skills. Also This course imparts physical realization of the dimensions of the objects and inculcate drawing and design soft tools.

Course Outcome:

After successful completion of the course, students will able to

- CO1:** Identify reference, principal plane, Auxiliary plane and utilize fundamentals of Engineering Drawing to draw and interpret Projection of Lines and Planes.
- CO2:** Draw various types of Engineering Curves and identify its applications
- CO3:** Draw Projection of different types of Solids resting on Horizontal Plane (HP).
- CO4:** Draw and develop Lateral surfaces of Solids.
- CO5:** Draw Orthographic views of given pictorial view.
- CO6:** Draw Isometric views of given pictorial orthographic view.

Course Contents

UNIT-I	Fundamentals of Engineering Drawing:	7 Hours
Introduction to drawing instruments and their uses, dimensioning, Method of Projections Projection of Point, Lines and Planes: Theory of projection of Oblique lines (to Locate Only Horizontal traces and Vertical Traces.), Projection of planes in both reference planes.		
UNIT-II	Engineering Curves	7 Hours
Conic section: Ellipse, Parabola, Hyperbola, by Focus- Directrix and Rectangle Method. Involute of circle, Cycloid, Archimedean Spiral, construction of Tangent and Normal to curves.		
UNIT-III	Projections of Solids	7 Hours
Introduction to solids, types of solids, Projection of solid (Cube, Prisms, Cylinder, Cone, Pyramid only with maximum six sided base) inclined to reference plane (Problems on Solids resting on Horizontal plane only)		
UNIT-IV	Development of Lateral Surfaces and Conventions	7 Hours
Development of Cone, Prism and Pyramids, Frustum of Cone and Pyramid, Conventions of Machine Elements and symbols.		

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UNIT-V	Orthographic Projections	7 Hours
Orthographic Projections of given pictorial View, Types of Sections, Full Sectional Orthographic Projections.		
UNIT-VI	Isometric Views	7 Hours
Introduction to isometric axes, Difference between Isometric views and Projections, Construction of isometric view from given orthographic views.		
LabContent		
Guidelines for Assessment		
1) Following listed Engineering Graphics Assignments shall be drawn using AutoCAD software. 2) Practical for the subject shall be engaged in minimum three batches (batch size of 22 students maximum) per division. 3) Lab Evaluation is a continuous assessment based on experiments performed, submission of results of experiment in the form of report/journal, timely completion, attendance and understanding.		
List of Laboratory Assignments		
1	Projections of Lines and Planes. (minimum two problems each)	
2	Engineering Curves. (minimum two problems)	
3	Projection of Solids. (minimum two problems)	
4	Development of Lateral surfaces. (minimum two problems)	
5	Orthographic projections. (minimum two problems)	
6	Isometric views. (minimum two problems)	
7	Mini Project to be done by students with respect to their circuit branches by using software for pertinent discipline.	
Text Books:		
T1. Textbook of Engineering Drawing by Reddy, K.Venkata , BS Publications		
T2. Textbook of Engineering Drawing by Dr. R.K Dhawan, S. Chand Publications		
T3. A Textbook of Engineering Drawing [Along with an introduction to AutoCAD 2015] by Rana Ramakant, Lal Roop.		
T4. A Textbook of Engineering Drawing by Prof. P.J Shah, D.Chand Publications.		
Reference Books:		
R1. N. D. Bhatt and V. M. Panchal, Engineering Drawing, Plane and Solid Geometry, charotar Publication House.		
R2. K.Venugopal, Engineering Drawing and Graphics, New Age Publication.		
R3. Basant Agrawal and C. M. Agrawal, Engineering Drawing, Tata McGraw- Hill Publishing Co. Ltd.		
R4. Basudeb Bhattacharya, Machine Drawing Includes Auto Cad Supplements, Oxford University Press, India.		
R5. Dhananjay A. Jolhe, Engineering Drawing with an Introduction to Auto CAD, Tata McGraw-Hill \ Publishing Co. Ltd.		



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F. Y. B. Tech (Group 1)
Academic Year – 2020-2021 Semester –I/II
[EE1101]: Basic Electrical Engineering

Teaching Scheme: TH: - 3 Hours/Week PR:- 2 Hours/Week	Credit TH: 3 PR:1	Examination Scheme: In Sem. Evaluation: 15 Marks Mid Sem. Exam : 25 Marks End Sem. Exam : 60 Marks TermWork : 25Marks Total : 125Marks
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Course Prerequisites: Modern Electron Theory, E.M.F. Electric Potential, Potential difference and current, Electrical circuit elements (R, L and C).

Course Objective: Impart a basic knowledge of electrical quantities to understand its effect on ever changing technology. Provide solution for the network by applying various laws and theorems. Provide working knowledge for the analysis of basic DC and AC circuits used in electrical devices. Understand fundamentals of single phase and poly-phase AC circuits. Apply the knowledge of magnetic circuits to electrical machines.

Course Outcome:

After successful completion of the course, students will able to:

CO1: Recall the elementary concepts of electrical engineering.

CO2: Apply various laws and theorems to complex electrical networks
CO3: Demonstrate basics of Electromagnetism and Magnetic Circuits.
CO4: Illustrate different terms applicable to ac fundamentals.

CO5: Relate single phase and poly phase ac circuits.

CO6: Explain fundamentals of single phase transformer and electrical drives.

Course Contents

UNIT-I	Introduction to Elementary concepts	7 Hours
Effect of temperature on resistance of conductors, insulators, semiconductors and alloys, Resistance temperature coefficient. Work, Power and energy calculations for thermal, mechanical and electrical systems, Concept of Earthing and safety precautions. Components of LT Switchgear: Fuse, MCB, MCCB and Contactor, Battery management Systems.		
UNIT-II	D.C. Circuits	7 Hours
Ohm's law, Resistances in series and parallel, Classification of Electrical Networks & Energy sources, source transformation, Kirchhoff's law, Network Simplifications using star-delta/delta star transformations, Superposition theorem, Thevenin's theorem, Maximum power transfer theorem.		
UNIT-III	Electromagnetism and Magnetic Circuits	7 Hours
Magnetomotive force and magnetic field strength, relative and absolute permeability, reluctance, series and parallel magnetic circuits. Electromagnetic induction, induced EMF, self and mutual inductance, coupling coefficient, energy stored in magnetic circuits.		

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UNIT-IV	AC fundamentals	7 Hours
Generation of alternating EMF, waveform terms and definitions, average value and RMS values for sinusoidal currents and voltages, peak factor, form factor, concept of phase and phase difference, phasor representation of an alternating quantity. Study of pure resistive, pure inductive and pure capacitive circuit.		
UNIT-V	A.C. Circuits	7 Hours
Single Phase A.C. Circuits: Single phase A.C. circuit RL, RC, RLC series, and parallel, phasor diagram, Concept of active, reactive, apparent power and power factor, Concept of series resonance and resonance frequency. Three phase circuits: Three Phase A.C. supply generation, phase sequence, concept of line and phase quantities, relationship between line and phase quantities for three phase Star and delta connected balanced load with phasor diagram. Active, reactive and apparent power.		
UNIT-VI	Single phase Transformer	7 Hours
Construction and principle of working, EMF equation, Different losses in transformer, Ideal and practical transformer, equivalent circuit, Voltage regulation and efficiency, condition for maximum efficiency. Autotransformer. Introduction to Electrical Drives and Control.		
Lab Content		
Guidelines for Assessment		
1) Practical for the subject shall be engaged in minimum three batches (batch size of 22 students maximum) per division.		
2) Lab Evaluation is a continuous assessment based on experiments performed, submission of results of experiment in the form of report/journal, timely completion, attendance and understanding.		
List of Laboratory Experiments		
1	Study of wiring components.	
2	Effect of temperature on resistance of a conducting material.	
3	Measurement of earth resistance	
4	Verification of Kirchhoff's voltage & current laws	
	Verification of Superposition Theorem.	
6	Verification of Thevenin's Theorem.	
7	Verification of maximum power transfer theorem.	
8	Determination of efficiency & regulation for single phase transformer by direct loading method.	
9	Lab Assignment: Calculation of Electricity bill considering domestic usage.	
10	Verification of voltage and current relations in three phase balanced star/delta connected load	
11	Study of RLC series circuit.	
Text Books:		
T1. Theory and problems of Basic Electrical Engineering-By I. J. Nagrath and Kothari PHI learning PVT. Ltd.		
T2. Electrical Technology: Volume -I & Volume - II, B. L. Thereja, S. Chand and Company Ltd, New Delhi.		
Reference Books:		
R1. Principles of Electrical Engineering by Del. Toro, PHI learning pvt Ltd.		
R2. Electrical Technology: B. L. Thereja, S. Chand and Company Ltd, New Delhi.		
R3. Electrical Technology: Edward Hughes, Pearson.		
R4. Electrical power: S.L. Uppal.		
R5. Solar Energy: Principles of Thermal Collection and Storage, 3e By S. P. Sukhatme.		



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TATHAWADE, PUNE-33
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 University,Pune)



F. Y. B. Tech (Group 1)

Academic Year – 2020-2021 Semester -I

[CS1101]: Introduction to Computer Programming

Teaching Scheme: TU:-1 Hour/Week PR:-2 Hours/Week	Credit TU:1 PR:1	Examination Scheme: TermWork : 25Marks Practical : 25Marks Total : 50Marks
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Course Prerequisites: Basic Computer Knowledge, Analytical and Logical skills.

Course Objective: To get familiar with the fundamentals of computer system and concept of problem solving. To build the programming skills using 'C' to solve real world problems. To understand concept of control structures, array, structure and function.

Course Outcome:

After successful completion of the course, students will able to:

CO1: Use the knowledge of computer system.

CO2: Apply problem solving concepts.

CO3: Demonstrate logic development using C programming.

CO4: Implement the programs using control structures.

CO5: Use the concept of array and structure to solve real time problems.

CO6: Apply the real world problems using concept of functions and string.

Course Contents

UNIT-I	Introduction to Computer Architecture	3 Hours
Introduction to computer system: characteristics, generations, components of computer, memory and its types, types of software-system, application software), types of system software-operating system, editor, compiler, assembler, linker, loader.		
UNIT-II	Introduction to Problem solving concepts	3 Hours
General Problem Solving Concepts-Types of problems, problems solving with computers, problem solving aspects, problem solving strategies, Introduction to program planning tools-algorithm, flow charts, pseudo-codes testing the solution, code the program, top down design.		
UNIT-III	Introduction to C programming	3 Hours
Variables, Operators, control structures in 'C': if, if-else, nested if-else, cascaded if-else and switch statement, loop control structures: for, while, do-while loops, break and continue statement.		
UNIT-IV	Array and Structure in C	3 Hours
Introduction to one-dimensional arrays, declaration, initialization and accessing array elements, two dimensional arrays. Introduction to structure, declaration of structure, initialization, declaration of structure variables and accessing members, array of structure.		
UNIT-V	Functions in C	3 Hours
Introduction to Function, Standard library functions and user defined functions, function declaration, function definition and function call - call by value and call by reference.		

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UNIT-VI	Strings and File handling in C	3-- Hours
String handling operations using library functions and user defined functions, File structure and basic operations on file, functions used for text and binary file handling in C.		
Lab Content		
Guidelines for Assessment		
1) Practical for the subject shall be engaged in minimum three batches (batch size of 22 students maximum) per division. 2) Lab Evaluation is a continuous assessment based on experiments performed, submission of results of experiment in the form of report/journal, timely completion, attendance and understanding.		
List of Assignments		
1	Implementation in C for using operators.	
2	Implementation in C for control statements.	
3	Implementation in C for Arrays and Functions.	
4	Implementation in C for Structures.	
5	Implementation in C for handling Strings.	
6	Implementation in C for File handling operations	
Text Books:		
T1. R. Gilberg, B. Forouzan, "Data Structures: A pseudocode approach with C", Cengage Learning, SBN 9788131503140. T2. G. A. V. PAI, "Data structures and Algorithms", Mc Graw Hill, ISBN -13: 978-0-07-066726-6 T3. Yashwant Kanetkar, "Let us C" and "Pointers in C", BPB Publication T4. "How to Solve it by Computer", R G Dromey ISBN 978-81-317-0562-9 T5. "Problem Solving and Programming Concepts", Maureen Spankle, ISBN 81-317-0711-3		
Reference Books:		
R1. E. Balguruswamy, Tata McGraw-Hill Education, 2008 - C (Computer program language) Donald E. Knuth, "The Art of Computer Programming", Vols. 1, Addison-Wesley, ISBN-13: 978-0201485417, ISBN-10: 0201485419. R2. T. E. Bailey, "Program design with pseudo code", Brooks/Cole Publisher, ISBN-10: 0534055745, ISBN-13: 978-0534055745. R3. Brian W. Kernighan, Dennis M. Ritchie, "The C Programming Language", Prentice Hall, ISBN 0131103628, Second Edition. R4. Yashavant Kanetkar "Let us c" BPB Publications, 01-Nov-2004 -C (Computer program language). R5. Lamey Robert, "Logical problem solving", Prentice Hall, ISBN: 9780130618825. R6. Henry Mullish, Herbert L. Cooper, "The Spirit of C", Thomson Learning, ISBN 0314285008. R7. Carlo Ghezzi, Mehdi Jazayeri, "Programming Language Concepts", John Wiley and Sons, ISBN-0471104264, Third Edition. R8. Introduction to Computing Systems: From Bits & Gate to C & Beyond (Computer Engineering) by Yale Patt (Author), Sanjay Patel (Author)		



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Syllabus for

Group 1

Semester II

Civil Engineering, Mechanical Engineering,
Electronics and Telecommunication Engineering and Electrical
Engineering.



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F. Y. B. Tech (Group 1)
Academic Year – 2020-2021 Semester -II
[ES1101]: Engineering Mathematics-II

Teaching Scheme: TH: - 3 Hours/Week TU:- 1 Hour/Week	Credit TH:3 TUT:1	Examination Scheme: In Sem. Evaluation: 15 Marks Mid Sem. Exam : 25 Marks End Sem. Exam : 60Marks TermWork : 25Marks
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Course Prerequisites : Integration, Differential Equation, Three-dimensional coordinate systems.

Course Objective: To make the students familiarize with Mathematical Modeling of physical systems using differential equations, advanced techniques of integration, tracing of curve, multiple integrals and their applications. The aim is to equip them with the techniques to understand advanced level mathematics and its applications that would enhance thinking power, useful in their disciplines.

Course Outcome:

After successful completion of the course, students will able to learn

- CO1:** The effective mathematical tools for solution of first order differential equations that model physical Processes such as Newton's law of cooling, electrical circuit, rectilinear motion, mass spring system, Heat transfer, etc.
- CO2:** Advanced integration techniques such as reduction formulae, Beta function, Gamma function, Differentiation Under Integral Sign (DUIS) and Error function, needed in evaluation of multiple integrals and their applications.
- CO3:** To trace the approximate shape of curve for given equation and measure arc length of various curves.
- CO4:** The concept of solid geometry using equation of sphere, cone and cylinder in comprehensive manner.
- CO5:** Evaluation of multiple integrals and its applications to find area bounded by curves, volume bounded by surfaces, center of gravity and moment of inertia.

Course Contents

UNIT-I	First Order Ordinary differential Equations	8 Hours
Exact differential equations, Equations reducible to exact form. Linear differential equations, Equations reducible to linear form, Bernoulli's equation.		
UNIT-II	Applications of Differential Equations	8 Hours
Applications of Differential Equations to Orthogonal Trajectories, Newton's Law of Cooling, Kirchoff's Law of Electrical Circuits, Rectilinear Motion, Simple Harmonic Motion, One dimensional Conduction of Heat..		
UNIT-III	Integral Calculus	8 Hours
Reduction Formulae, Beta and Gamma functions, Differentiation Under Integral Sign and Error		

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UNIT-IV	Curve Tracing	7 Hours
Tracing of Curves – Cartesian, Polar and Parametric curves, Rectification of curves.		
UNIT-V	Solid Geometry	8 Hours
Cartesian, Spherical polar and cylindrical coordinate systems, Sphere, Cone and Cylinder.		
UNIT-VI	Multiple Integrals and their Applications	8 Hours
Double and Triple integrations, Change of order of integration, Applications to find Area, Volume, Mass, Centre of Gravity and Moment of Inertia.		
Guidelines for Tutorial and Term Work		
<p>1) Tutorial for the subject shall be engaged in minimum three batches (batch size of 22 students maximum) per division.</p> <p>2) Term work shall consist of six assignments on each unit-I to unit-VI and is based on performance and continuous internal assessment.</p>		
Text Books:		
<p>T1. Higher Engineering Mathematics by B. V. Ramana (Tata MacGraw Hill)</p> <p>T2. Higher Engineering Mathematics by B.S. Grewal (Henna Publication, Delhi)</p>		
Reference Books:		
<p>R1. Advanced Engineering Mathematics, by Erwin Kreyszig (Wiley Eastern Ltd.)</p> <p>R2. Advanced Engineering mathematics by M.D. Greenberg (Pearson Education)</p> <p>R3. Advanced Engineering Mathematics, 7e, by Peter V. O’Neil (Thomson Learning)</p> <p>R4. Thomas’s Calculus-Early Transcendentals (Addison- Wesley, Pearson)</p> <p>R5. Applied Mathematics (Volume I and II) by P.N. Wartikar and J.N. Wartikar Vidyarthi Griha Prakashan, Pune.</p> <p>R6. Differential Equations by S.L. Ross (3rd Ed Wiley, India 1984)</p>		



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F. Y. B. Tech (Group 1)
Academic Year – 2020-2021 Semester –I/II

[ES1103]: Engineering Chemistry

Teaching Scheme: TH: - 3 Hours/Week PR:- 2 Hours/Week	Credit TH: 3 PR:1	Examination Scheme: In Sem. Evaluation: 15 Marks Mid Sem. Exam : 25 Marks End Sem. Exam : 60Marks Lab Evaluation : 25Marks
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Course Prerequisites: Volumetric analysis, Primary Reference Electrode – Standard hydrogen electrode, Electrochemical series, Electromagnetic Spectrum and Characteristics of Electromagnetic radiation.

Course Objective: To acquire knowledge of chemical analysis and techniques for testing quality of water for its domestic and Industrial use. To understand electro analytical techniques for chemical analysis with reliability and reproducibility in measurements. To gain knowledge of structure, properties and applications of specialty polymers and nano materials. To study Fossil Fuels and alternative fuels with their properties and applications. To understand spectroscopic techniques like UV-Visible and IR for analysis of chemical compounds. To learn significance science of corrosion and preventive methods used for minimizing corrosion.

Course Outcome:

After successful completion of the course, students will able to:

- CO1:** Utilize different methodologies for analysis of water, technique for softening water.
- CO2:** Utilize different analytical methods for analysis of various chemical compounds.
- CO3:** Demonstrate the knowledge of advanced engineering materials for various engineering applications.
- CO4:** Analyze fuel and suggest alternative fuel on the basis of their properties and applications.
- CO5:** Identify nature of conjugation and functional group of chemical compounds using UV-Visible and IR techniques respectively.
- CO6:** Explain different causes for corrosion and suggest preventive methods.

Course Contents

UNIT-I	Water Technology	7 Hours
Introduction, Impurities in water, Concept of Hardness, Types of Hardness, Units and numerical – Determination of hardness by EDTA method–numerical by using molarity concept, Alkalinity of water and numerical based on alkalinity. Ill effects of hard water in boiler: Priming and foaming, Boiler corrosion, Scales and Sludge's, Caustic Embrittlement. External treatment – Zeolite or Permutit method and numerical based on it, Ion Exchange or Deionization or Demineralization Method, Desalination of brackish water by Reverse Osmosis and Electro dialysis.		
UNIT-II	Electroanalytical Techniques	7 Hours
Introduction: – Types of reference electrodes – Calomel electrode, Indicator electrode (Glass electrode), Ion selective Electrodes – Ion Selective membranes such as solid membrane, enzyme based membrane and gas sensing membrane, A] p ^H metry – Standardization of p ^H meter, p ^H metric titration of strong acid Vs strong base with titration curve and calculations.		

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B] Conductometry–, Introduction, Conductivity Cell, Conductometric titrations of acid versus base with titration curve.		
UNIT-III	Engineering Materials	7 Hours
A] Specialty Polymers: Introduction, Preparation, Properties and applications of the following polymers: Engineering Thermoplastic: Polycarbonate, Conducting polymers - Polyacetylene, Biodegradable polymer – Polyhydroxybutyrate – hydroxyvalerate, Electroluminescent Polymers - Polyphenylene, polymer composites – Fibre Reinforced Plastic (FRP) – Glass Reinforced and Carbon Reinforced polymer composite. B] Nanomaterials: Introduction, Classification of nanomaterials based on dimensions (zero-dimensional, One-dimensional, two-dimensional and three-dimensional), structure, properties and applications of grapheme and carbon nanotubes.		
UNIT-IV	Fuels	7 Hours
Introduction: Definition of fuel, Classification of fuel based on chemical reactions and Characteristics of ideal fuels, Calorific Value (CV): Higher Calorific Value (HCV) and Lower Calorific Value (LCV) and its units, Determination of calorific value – Principle, construction and working of Bomb calorimeter and Boy's gas calorimeter and numerical. Solid fuel – Coal - proximate and ultimate analysis of coal and numerical, Liquid fuel – Petroleum, refining of petroleum/crude oil, composition, boiling point range and uses of various fractions. Gaseous fuel: Composition, properties and applications of CNG, Hydrogen gas as a future fuel. Alternative fuels: Power alcohol and Biodiesel.		
UNIT-V	Spectroscopic Techniques	7 Hours
Introduction to spectroscopic techniques and types of spectroscopy. A] UV-Visible Spectroscopy: Introduction, Interaction of electromagnetic radiation with matter, statement of Beer's and Lambert's law, absorption of UV radiations by organic molecule leading to different electronic transitions, Terms involved in UV-Visible Spectroscopy – Chromophore, auxochrome, bathochromic shift, hypsochromic shift, hyperchromic effect and hypochromic effect. Fundamentals and types of spectroscopy, Instrumentation and basic principle of Single beam UV-Visible spectrophotometer, Applications of UV-Visible spectroscopy. B] IR spectroscopy: Introduction, Principle of IR Spectroscopy (Selection Rule), Types of vibrations: Stretching (symmetric and asymmetric) and bending (scissoring, rocking, wagging and twisting), Conditions of absorption of IR radiations, vibration of diatomic and polyatomic molecules. Factors affecting IR group frequencies. Instrumentation with block diagram. Parts of IR Spectrum, fundamental group region, fingerprint region, applications of IR spectroscopy.		
UNIT-VI	Corrosion Science and Its Preventions	7 Hours
Introduction – Types of corrosion, Dry corrosion - mechanism – Pilling-Bedworth rule (PBR), Wet corrosion-mechanism – H ₂ evolution and O ₂ absorption, Factors affecting the rate of corrosion, Methods of corrosion control, cathodic and anodic protection, Metallic coatings – Types of coating, Methods of applications (Hot Dipping, metal cladding, cementation and electroplating).		
Lab Contents		
Guidelines for Assessment		
1) Practical for the subject shall be engaged in minimum three batches (batch size of 22 students maximum) per division. 2) Lab Evaluation is a continuous assessment based on experiments performed, submission of results of experiment in the form of report/journal, timely completion, attendance and understanding.		
List of Laboratory Experiment		
1	Estimation of alkalinity of given water sample.	
2	Determination of total hardness of water using EDTA method.	



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3	Determination of normality of acid in a titration of strong acid and strong base using pH meter.
4	Conductometric titration of strong acid with strong base.
5	Preparation of Phenol formaldehyde or Urea formaldehyde resin.
6	Determination of moisture, volatile matter and ash content of a given coal sample by proximate analysis.
7	To verify Beer's law for solution of CuSO_4 using colorimeter and determine concentration in their solutions of unknown concentration.
8	Study of electroplating of copper on iron/stainless steel surface for corrosion protection.
9	Determination of molecular weight of Polyvinyl Alcohol (PVA) by using Ostwald's Viscometer.
10	Preparation of biodiesel from oil.
11	Analysis of IR Spectrum of chemical compounds.

Text Books:

T1. Engineering Chemistry by O. G. Palanna, Tata Mcgraw Hill Education Pvt. Ltd.

T2. Textbook of Engineering Chemistry by Dr. S. S. Dara, Dr. S. S. Umare, S. Chand & Company Ltd.

T3. Textbook of Engineering Chemistry by Dr. Sunita Rattan, S. K. Kataria & Sons Publisher.

Reference Books:

R1. Engineering Chemistry, Jain and Jain, Dhanpat Rai Publishing Company Edition.

R2. Engineering Chemistry, Wiley India Pvt. Ltd.


R3. Basic concepts of Analytical Chemistry, S. M. Khopkar, New Age International Publishers.

R4. Instrumental Methods of Chemical analysis, G. R. Chatwal & S. K. Anand, Himalaya Publishing House.

R5. Analytical Chemistry, B. K. Sharma, Educational Publishers.

R6. Polymer Science, V. R. Govarikar, N.V. Vishwanathan, Jayadev Sreedhar, New Age International Publishers.

R7. Spectroscopy of Organic Compounds, 2 ed P. S. Kalsi, New Age-International Ltd., Publisher.



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F. Y. B. Tech (Group 1)
Academic Year – 2020-2021 Semester –II
[CE1102]: Engineering Mechanics

Teaching Scheme: TH: - 3 Hours/Week PR:- 2 Hours/Week	Credit TH: 3 PR:1	Examination Scheme: In Sem. Evaluation: 15 Marks Mid Sem. Exam : 25 Marks End Sem. Exam : 60Marks Lab Evaluation : 25Marks
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Course Prerequisites: Elementary applied calculus- topics include graphs, derivatives and integral of functions. Introductory Algebra and Trigonometry based course on classical mechanics. Introductory Physics, Newtons laws and conservation of energy and momentum for solving problems in dynamics. Use of law of Universal gravitation to analyze the behavior of falling objects and objects in orbital motion.

Course Objective: The objectives of this course is to make students to learn basics of engineering Mechanics concepts and its application to the real world problems, solve problems involving Forces, loads and Moments and know their applications in allied subjects.

Course Outcome:

After successful completion of the course, students will able to:

- CO1:** Understand basic concept of forces, moments and couples in two dimensions.
- CO2:** To apply concepts of centroid and to understand the concept of space force system.
- CO3:** To analyze rectilinear and curvilinear motion under action of constant and variable forces.
- CO4:** Apply concept of Free Body Diagram for static equilibrium in 2D force system.
- CO5:** Apply energy and momentum principles for various problems.
- CO6:** Analyze trusses, cables and to apply concept of friction.

Course Contents

UNIT-I	Fundamentals of Mechanics and Force systems	7 Hours
Principle of statics, force systems, resolution and composition of forces. Resultant of general forces, Moment of force, Varignon's theorem, resultant of parallel force system. Couple, Equivalent force couple system.		
UNIT-II	Equilibrium of space forces and centroid	7 Hours
Resultant of concurrent and parallel forces in space, Equilibrium of concurrent and parallel forces in space, Moment of forces in space. Centroid of plane lamina and wire bends.		
UNIT-III	Motion of Particles	7 Hours
Kinematics:- Basic concepts, equations of motion for constant acceleration and motion under gravity. Variable acceleration and motion curves. Relative motion. Curvilinear motion:- Rectangular coordinate system (Projectile Motion), n-t coordinate system, polar coordinate		
UNIT-IV	Equilibrium of Force System	7 Hours
Free body diagram, equilibrium of concurrent, parallel and general forces in plane. Distributed forces, Types of beam: Simple and compound beams, Types of supports and reactions.		

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UNIT-V	Energy and Momentum	7 Hours
Work, power, energy conservatives and non- conservative forces. Conservation of energy and work energy principle for motion of particle. Impulse momentum, conservation of momentum and impulse momentum principle of particle. Direct central impact and coefficient of restitution.		
UNIT-VI	Friction, Analysis of Trusses and Cables	7 Hours
Friction: Laws of friction, application of friction on inclined plane, Application of flat belt. Two force members: analysis of plane truss by method of joints, method of sections. Cables subjected to point loads.		
Lab Contents		
Guidelines for Assessment		
1) Practical for the subject shall be engaged in minimum three batches (batch size of 22 students maximum) per division. 2) Lab Evaluation is a continuous assessment based on experiments performed, submission of results of experiment in the form of report/journal, timely completion, attendance and understanding.		
List of Laboratory Experiments		
1	Verification of location of Centroid of plane laminas	
2	To locate the centroid for wire bend.	
3	To determine Coefficient of restitution.	
4	Verification of Lami's theorem.	
5	To determine force in space frame system.	
6	To determine mass moment of inertia of Circular Bodies.	
7	To study Projectile Motion.	
8	To determine coefficient of friction for various pairs of surfaces in contact.	
Text Books:		
1. A Text book of Engineering Mechanics by R. S. Khurmi, S. Chand publications, ISBN: 9788121926164.		
2. A textbook of Engineering Mechanics by R. K. Bansal, Sanjay Bansal, Laxmi publications, 8th edition.		
Reference Books:		
R1. F.P. Beer and E.R. Johnston "Vector Mechanics for Engineers Vol. I and II", 10th edition, Tata McGraw-Hill Education, 2012, ISBN: 978-0077402327		
R2. Engineering Mechanics: S Timoshenko, Dtp Young and J.V. Rao, Tata McGraw Hill Education Pvt. Ltd. New Delhi		
R3. A. Nelson "Engineering Mechanics: Statics and Dynamics", 1 st edition, Tata McGraw-Hill Education, 2009, ISBN: 978-0-07-014614-3		
R4. Ferdinand Singer, "Engineering Mechanics Statics and Dynamics", 3rd edition Harper and Row, 1994 ISBN: 0063506610		
R5. Engineering Mechanics by Basudeb Bhattacharyya- Oxford University Press		



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F. Y. B. Tech (Group 1)

Academic Year – 2020-2021 Semester –I/II

[ME1102]: Basic Mechanical and Robotics Engineering

Teaching Scheme: TH: - 3 Hours/Week PR:- 2 Hours/Week	Credit TH: 3 PR:1	Examination Scheme: In Sem. Evaluation: 15 Marks Mid Sem. Exam : 25 Marks End Sem. Exam : 60Marks Lab Evaluation : 25Marks
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Course Prerequisites: Physical properties- Force, pressure, volume, stress, strain etc., Types of thermodynamics systems- open and closed system.

Course Objective: This course will help students to acquire knowledge of mechanical engineering and describe the scope of mechanical engineering with multidisciplinary industries. It gives information about basic domains and workflow in Mechanical Industry. Also it will help learner, to identify various Machine elements and power transmission devices with their functions. Students will come to know the concept of design, mechanisms and fundamentals of material science. Various manufacturing processes and machine tools are also discussed. This course also focuses on thermodynamics applied to industrial applications & basics of Robotics Engineering with its applications in Automation.

Course Outcome:

After successful completion of the course, students will be able to:

CO1: Compare different mechanical elements with its application.

CO2: Explain different mechanisms and design process.

CO3: Determine material densities and atomic packing factors of different structures of materials.

CO4: Describe various manufacturing processes and machine tools suitable for particular industrial application

CO5: Explain the basic concepts of thermodynamics and its application, principle of energy conservation and modes of heat transfer.

CO6: Explain the basics of Robotics and its applications in industries.

Course Contents

UNIT-I	Introduction to Mechanical Engineering	7 Hours
Mechanical Engineering and its domains: Design, Production and Thermal Engineering, Introduction to Mechanical Industry: Design, Production, Quality control and Inspection departments, Mechanical Elements: Holding, Supporting and Power transmitting elements.		
UNIT-II	Fundamentals of Design and Mechanisms	6 Hours
Design: Definition, Steps in Design process, Mechanical Properties, National/International design standards, Introduction to Machine & Mechanism. Mechanism: Four Bar Mechanism, Slider Crank Mechanism.		
UNIT-III	Fundamentals of Material Science	7 Hours
Fundamental concepts of Crystal, Unit Cells, Miller Indices, Metallic Crystal Structures, Crystal Systems, Linear and Planer Densities, Density computation, Classification of Engineering Materials and their properties.		

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UNIT-IV	Manufacturing Processes and Machine Tools	7 Hours
Manufacturing Processes: Classification, Sand Casting, Metal forming, Sheet metal working, Machining, Metal joining & Surface finishing processes. Machine Tools: Introduction to Conventional Lathe, CNC, VMC.		
UNIT-V	Introduction to Thermal Engineering and Heat Transfer	7 Hours
Thermal Engineering: Laws of Thermodynamics, their Limitations and applications, IC Engines, Refrigeration and air conditioning, Measurements of temperature and pressure. Heat Transfer: Conduction, Convection and Radiation.		
UNIT-VI	Fundamentals of Robotics	7 Hours
Laws of Robotics, Classification of Robots, Robot anatomy, Point to Point and Continuous path robotic systems, Joints, End Effectors, Grippers, Robot Specification, General considerations and Applications of Robot.		
LabContents		
Guidelines for Assessment		
1) Practical for the subject shall be engaged in minimum three batches (batch size of 22 students maximum) per division.		
2) Lab Evaluation is a continuous assessment based on experiments performed, submission of results of experiment in the form of report/journal, timely completion, attendance and understanding.		
List of Laboratory Experiments		
1	Demonstration on performance of power transmitting devices: Gears, Belt drive and Chain drive.	
2	Study of mechanisms: Four bar mechanism, slider crank mechanism and their inversions.	
3	Use of ASTM/IS Standards for tensile testing	
4	One job on CNC and VMC Machine.	
5	One fabrication job using welding process.	
6	To find mechanical efficiency of Diesel Engine.	
7	To calculate Coefficient of Performance for domestic refrigerator setup.	
8	Study and demonstration of an Industrial Robot	
9	Mini Project/ Seminar on a topic related to Mechatronics. (group of 4 students)	
10	Report on Visit to one Mechanical or Manufacturing Industry.	
Text Books:		
T1: G. Shanmugam, S. Ravindran “ Basic mechanical Engineering”, Tata McGraw- Hill Publication Co. Ltd		
T2: Choudhari, Hajara “ Elements of Workshop Technology”, Volume I and II, Media Promoters and Publishers, Mumbai.		
T3: R. K. Purohit “Foundation of Mechanical Engineering”, Scientific Publishers.		
T4: C.S. Chetankumar, B.P. Mahesh, “Elements of Mechanical Engineering”, S.Chand Publications.		
Reference Books:		
R1. P. K. Nag “Thermodynamics” Tata McGraw- Hill Publication Co. Ltd		
R2. V.B. Bhandari “Design of Machine elements” Tata McGraw-Hill Publishing Co. Ltd.		
R3. S. S. Ratan “Theory of Machine” Tata McGraw- Hill Publication Co. Ltd		
R4. Arora and Domkundwar “Thermal Engineering”, Dhanpat Rai and Sons.		
R5. V. D Kodgire and S.V. Kodgire “Material Science and Metallurgy”, Everest Publications.		
R6. Choudhari, Hajara “Elements of Workshop Technology”, Volume I and II, Media Promoters and Publishers, Mumbai.		
R7. S. P. Venkateshan “Heat transfer”, Ane books Pvt. Ltd.		



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F. Y. B. Tech (Group 1)

Academic Year – 2020-2021 Semester –I/II

[EC1101]: Basic Electronics and Biomedical Engineering

Teaching Scheme: TH: - 3 Hours/Week PR:- 2 Hours/Week	Credit TH: 3 PR:1	Examination Scheme: In Sem. Evaluation: 15 Marks Mid Sem. Exam : 25 Marks End Sem. Exam : 60Marks Lab Evaluation : 25Marks
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Course Prerequisites: Semiconductor materials, P-N junction diode, V-I characteristics of Diode, Concept of Communication systems, Bandwidth, Basic number system, concept of transducer and sensors.

Course Objective: This course emphasizes on an introductory and broad treatment in the field of Electronics and biomedical Engineering to facilitate better understanding of the devices, instruments and sensors used in engineering applications.

Course Outcome:

After successful completion of the course, students will able to:

CO1: Explain the basic concepts and working of electronic devices like diode, BJT.

CO2: Elaborate working of operational amplifier, IC 555 and various regulators

CO3: Describe the need and types of modulation Techniques.

CO4: Apply the concept of logic gates, microprocessor, microcontroller and Arduino in electronic circuits.

CO5: Recognize types of Sensors for different applications.

CO6: Identify electrodes for Bio signal measurements and describe function of medical instruments.

Course Contents

UNIT-I	Basics of Electronics Devices	7 Hours
Diode as a Rectifier, Half Wave and Full Wave Rectifiers with and without Filters, Zener Diode – Operation and Applications, Breakdown Mechanisms, LEDs, Photo Diode, BJT structure, configurations, Operating Point (DC Load Line), applications as amplifier and switch.		
UNIT-II	Integrated Circuits	7 Hours
Introduction to Op-Amp (Block Diagram), Modes of operations, Parameters and applications to op-amp IC such as IC 741, Introduction to multivibrator IC such as IC 555(Block Diagram), modes of operation and application as Astablemultivibrator. Block diagram of Fixed voltage regulator IC's 78XX, 79XX, and variable voltage regulator such as LM317, LM337.		
UNIT-III	Electronic Communication Systems	7 Hours
Block diagram of electronic Communication System, IEEE Frequency spectrum, Wired and Wireless media, Modulation techniques: AM and FM, Mobile communication system, Introduction to 2G, 3G, 4G &5G Technologies, Introduction to GSM and GPS.		
UNIT-IV	Digital Systems	7 Hours
Numbersystem-Binary, octal,hexadecimal,greys,Arithmeticoperationsandtheirconversions.Logic gates,Booleanalgebra,Combinationalcircuits suchasAdder,MUX,DEMUX.Sequentialcircuits		

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such as Flip Flops (SR-flip flop, JK Flip-Flop, D & T Flip-Flop). BCD to Seven Segment display. Introduction to microprocessor, microcontroller (block diagram, comparison), Introduction to Arduino(block diagram, Integrated Development Environment).

UNIT-V	Sensor Technologies	7 Hours
Basic Instrumentation system, selection criteria of sensors, Classification of sensors, Types of sensors such as Linear Variable Differential Transducer, Load cell, Ultrasonic, Optical, semiconductor sensors, Piezoelectric, soil moisture, fingerprint, speed, gas sensors, Temperature sensor such as Thermocouple, Thermistor and RTD.		
UNIT-VI	Biomedical signals and Modern Medical Systems	7 Hours
Sources of biomedical signals, Basic medical instrumentation system, recording electrodes, Skin contact impedance, Motion artefacts, Types of Electrodes to Measure Bio-signals-EEG, ECG, EMG Human Machine Interface (HMI), Brain Computer Interface (BCI), X-ray, CT-scan, Magnetic Resonance Imaging (MRI), ECG, EEG and EMG recorder.		

Lab Contents

Guidelines for Assessment

- 1) Practical for the subject shall be engaged in minimum three batches (batch size of 22 students maximum) per division.
- 2) Lab Evaluation is a continuous assessment based on experiments performed, submission of results of experiment in the form of report/journal, timely completion, attendance and understanding.

List of Laboratory Experiments

1	Study of electronics components such as Resistors, Inductors, Capacitors Switches, Connectors, wires, cables etc
2	Study of different Electronics measuring Instruments such as a) Digital Multi Meter and controls b) Function / Signal Generator and controls c) Cathode Ray Oscilloscopes, measurements of frequency and amplitude of AC signal.
3	Build and Test single stage CE Amplifier and calculate voltage gain.
4	Verify the parameters of IC-741-CMRR, I/P bias current, slew Rate, Input offset voltage OR Design Astable multivibrator using IC 555
5	Perform AM generation technique, observe waveform and calculate modulation Index. OR Perform FM generation technique, observe waveform and calculate modulation Index.
6	Verify truth Tables of Logic Gates and BCD to 7 Segment display.
7	Interface LED/LCD to Arduino Development board. OR Interface Temperature Sensor /LDR/Smoke detector sensors to Arduino Development board.
8	Study and Identify various electrodes used to measure bio-signals OR Study of EEG and ECG recorder

Text Books:

- T1.** "Electronics Devices" by Thomas.L.Floyd 9th Edition, Pearson .
T2. R.P.Jain, Modern Digital Electronic, 3rd edition, 12th reprint TMH publication, 2007.
T3. R. S. Khandpur; Handbook of Biomedical Instrumentation; Third Edition, TMH Publication, 2012.



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T4. “Sensors and Transducers” by D. Patrnabis, 2nd Edition, PHI

Reference Books:

- R1.** H. S. Kalasi, “Electronic Instrumentation”, TMH publication.
- R2.** Louis E. Frenzel (2006), Communication Electronics, Principles and Applications, Third Edition, TMH publication.
- R3.** Vijay Garg, Wireless Communications & Networking. 2nd Edition, Elsevier, 28-Jul-2010.
- R4.** The 8051 Microcontroller and Embedded Systems Using Assembly and C. Second Edition. Muhammad Ali Mazidi. Janice GillispieMazidi. Rolin D. McKinlay.
- R5.** J. M. Hughes (2016), Arduino: A Technical Reference A Handbook for Technicians, Engineers, and Makers, O’Reilly Media, Inc.
- R6.** “Sensors Handbook”, by S. Soloman, 2nd Edition.

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F. Y. B. Tech (Group 1)

Academic Year – 2020-2021 Semester -II

[CS1102]: Introduction to Python Programming

Teaching Scheme: TU:-1 Hour/Week PR:-2 Hours/Week	Credit TU:1 PR:1	Examination Scheme: TermWork : 25Marks Practical : 25Marks Total : 50Marks
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Course Prerequisites: Introduction to Computer Programming, Analytical and Logical skills.

Course Objective: To know the basics algorithmic problem solving for reading and writing simple Python programs. To learn data types, input output statements, decision making, looping and functions in Python and also understand features of Object Oriented Programming and filehandling using Python. To introduce data science.

Course Outcome:

After successful completion of the course, students will able to:

- CO1:** Use the knowledge of Python programming constructs.
- CO2:** Demonstrate logic development using Python.
- CO3:** Apply functions and string functions.
- CO4:** Use the concept of file handling and dictionaries.
- CO5:** Demonstrate Python program using object oriented concepts.
- CO6:** Understand the concept of data science.

Course Contents

UNIT-I	Introduction to Python	2 Hours
Features of python, Understanding python blocks, Understanding Python variables, Comments, Indentation, Writing a simple Python program, Data types: int, float, Python basic Operators.		
UNIT-II	Python program flow control	3 Hours
Conditional blocks-if, else and if-elif...else chain, for loop using ranges, string, and list. Use of while loops, break, continue statements in python		
UNIT-III	Functions and Strings	4 Hours
Need for functions, Function: definition, call, variable scope and lifetime, the return statement. Defining functions, Lambda or anonymous function, documentation string, Strings and Operations- concatenation, appending, slice operation. Defining list and list slicing.		
UNIT-IV	File Handling and Dictionaries	3 Hours
File path, types of files, opening –closing files, reading and writing files. Dictionary method. Dictionaries- creating, assessing, adding and updating values.		
UNIT-V	Python Object Oriented Programming	3 Hours
Features of OOP: classes, objects, methods and message passing, inheritance, polymorphism, containership, reusability, delegation, data abstraction and encapsulation.		

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UNIT-VI	Introduction to Data Science	4 Hours
Overview of dataset, Introduction to data science life cycle, Statistical methods- min, mode, variance, std. deviation, Data Analysis techniques – T-test, Z-test.		
Lab Contents		
Guidelines for Assessment		
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List of Assignments		
1	Write a program that demonstrate basic python block and operators.	
2	Write a program that demonstrates concepts of list and list slicing and tuple.	
3	Write a program that demonstrate decision control statements (using if, else, elif and while loops).	
4	Write a program that demonstrate loop manipulation using pass, continue, break and else.	
5	Write a program that demonstrates list manipulation using in-build methods.	
6	Write an application that demonstrates dictionary manipulation.	
7	Write an application that demonstrates the use of various file handling functions.	
8	Write a program to implement string related functions.	
9	Write a program to demonstrate data analysis using statistical methods.	
Text Books:		
T1. Allen B. Downey, Think Python: How to Think Like a Computer Scientist”, 2nd edition, Updated for Python 3, Shroff/O’Reilly Publishers, 2016 T2. Guido van Rossum and Fred L. Drake Jr, “An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.		
Reference Books:		
R1. Charles Dierbach, “Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013. R2. John V Guttag, “Introduction to Computation and Programming Using Python”, Revised and expanded Edition, MIT Press, 2013 R3. Kenneth A. Lambert, “Fundamentals of Python: First Programs”, CENGAGE Learning, 2012. R4. Paul Gries, Jennifer Campbell and Jason Montojo, “Practical Programming: An Introduction to Computer Science using Python 3”, Second edition, Pragmatic Programmers, LLC, 2013. R5. Robert Sedgewick, Kevin Wayne, Robert Dondero, “Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016. R6. Research Methodology Methods & technique by C.R. Kothari		



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