B.E. (Mechanical Engineering)

IV SEMESTER

S. No.	Code No.	Subject	Scheme of Instruction				Scheme of Examination		Credits
			L	T	P/D	Duration in Hrs	CIE	SEE	
1	6ES403CS	Python Programming	3	-	-	3	40	60	3
2	6PC404ME	Applied Thermodynamics	3	1	-	4	40	60	4
3	6PC405ME	Manufacturing Processes	3	-	-	3	40	60	3
4	6PC406ME	Fluid Mechanics & Hydraulic Machines	3	-	-	3	40	60	3
5	6PC407ME	Kinematics of Machines	3	1	-	4	40	60	4
6	6MC402HS	Essence of Indian Traditional Knowledge	2	-	-	2	40	60	-
7	6ES453CS	Python Programming Lab	-	-	2	2	40	60	1
8	6PC453ME	Applied Thermodynamics Lab	-	-	2	2	40	60	1
9	6PC454ME	Manufacturing Processes Lab	-	-	2	2	40	60	1
10	6PC455ME	Fluid Mechanics & Hydraulic Machines Lab	-	-	2	2	40	60	1
Total			**17**	**2**	**8**	**27**	**400**	**600**	**21**

*S=Satisfactory, U= Unsatisfactory

Note : The students have to undergo an Internship of two weeks' duration after IV semester and credits will be awarded in V semester after evaluation.

Course Code	Course Title						Core/Elective
6ES403CS	PYTHON PROGRAMMING						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Experience with a high level language (C/C++, Java, MATLAB) is suggested	3	-	-	-	40	60	3

COURSE OBJECTIVES

1. To be able to introduce core programming basics and program design with functions using Python programming language.
2. To understand a range of Object-Oriented Programming, as well as in-depth data and information processing techniques.
3. To understand the high-performance programs designed to strengthen the practical expertise

COURSE OUTCOMES

1. Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.
2. Demonstrate proficiency in handling Strings and File Systems.
3. Create, run and manipulate Python Programs using core data structures like Lists, Tuples and Dictionaries.
4. Interpret the concepts of Object-Oriented Programming as used in Python.
5. Create and animate a variety of shapes and develop an application with graphical user interface (GUI).
6. Implement exemplary applications related to Network Programming, Web Services and Databases in Python.

UNIT - I

Introduction to Python: installing Python, basic syntax, interactive shell, editing, saving, and running a script. The concept of data types, variables, assignments, immutable variables, numerical types, arithmetic operators and expressions, comments in the program, understanding error messages. Conditions, Boolean logic, logical operators, ranges, Control statements.

UNIT - II

Strings and Files: Strings and text files, manipulating files and directories, os and sys modules, text files: reading/writing text and numbers from/to a file, creating and reading a formatted file (csv or tab-separated). String manipulations: subscript operator, indexing, slicing a string, strings and number system: converting strings to numbers and vice versa.

Lists, Tuples, and Dictionaries : Basic list operators, replacing, inserting, removing an element, searching and sorting lists, dictionary literals, adding and removing keys, accessing and replacing values, traversing dictionaries

UNIT - III

Design with functions: Hiding redundancy, complexity, arguments and return values, formal vs actual arguments, named arguments. Program structure and design. Recursive functions.

Classes and OOP: Classes, objects, attributes and methods, defining classes, design with classes, data modeling, persistent storage of objects, inheritance, polymorphism, operator overloading (_eq_, _str_, etc), abstract classes, exception handling, try block.

UNIT - IV

Simple Algorithms and Data structures: Search Algorithms, Sorting Algorithms, Hash Tables.

Simple Graphics and Image Processing: "Turtle" module, simple 2d drawing - colors, shapes, digital images, image file formats, image processing Simple image manipulations with 'image' module (convert to bw, greyscale, blur, etc).

UNIT - V

Graphical user interfaces: Event-driven programming paradigm, tkinter, module, creating simple GUI, buttons, labels, entry fields, dialogs, widget attributes - sizes, fonts, colors layouts, nested frames.

Multithreading, Networks, and Client/Server Programming: Introduction to HTML, interacting with remote HTML server, running html-based queries, downloading pages, CGI programming, programming a simple CGI form.

TEXT BOOKS

1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2nd Edition, 2017, Cengage Learning.
2. John V Guttag. "Introduction to Computation and Programming Using Python", Prentice Hall of India.

REFERENCE BOOKS

1. Mark Summerfield. - Programming in Python 3: A Complete introduction to the Python Language, Addison-Wesley Professional, 2009.
2. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist, 2nd edition, Updated for Python 3, Shroff/O, Reilly Publishers, 2016.
3. NPTEL Course, Programming, Data Structures and Algorithms using Python, Link: https://nptel.ac.in/courses/106106145.
4. NPTEL Course, The Joy of Computing using Python, Link: https://nptel.ac.in/courses/106106182.
5. FOSSEE, Python, Link: https://python.fossee.in/

Course Code	Course Title						Core/Elective
6PC404ME	APPLIED THERMODYNAMICS						CORE
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
L	T	D	P				
THERMODYNAMICS	3	1	-	-	40	60	4

COURSE OBJECTIVES:

It is intended to make the students to :

1. Describe the types and working principle of reciprocating air compressors.
2. Explain the construction and working principles of internal combustion engines.
3. Discuss the combustion phenomenon in petrol and diesel engines.
4. Classify and explain the working principles of steam boilers and condensers.
5. Analyze vapour power cycles and steam nozzles.

COURSE OUTCOMES :

After completing the course, the students will be able to

1. Analyze the behaviour of reciprocating compressors
2. Explain the thermal design and working principles of IC Engines and their supportingsystems
3. Describe the working principle of IC Engines and combustion phenomenon of SI and CIengines and thermal design of Combustion chambers.
4. Explain the thermal design and working principles of Power plant devices like Boilers,Condensers and Nozzles.
5. Analyze the performance of power plants based on the Rankine cycle, including the effect of enhancements such as superheat, reheat and regeneration.

UNIT - I :

Reciprocating Air Compressors: Applications of compressed air, Classification of compressors- single stage and multistage compressors, Derivation of work done with and without clearance volume, Work done of multistage compressors, effect of clearance volume on work done, Inter- cooling and After-cooling.

UNIT - II:

Internal Combustion Engines: Classification of IC engines, working principle of 2 stroke, 4 stroke SI and CI engines, Valve and Port-timing diagrams.

Engine systems: Battery and Magneto ignition systems, working principle of simple carburettor and its limitations, Multipoint fuel injection system, Lubrication systems, cooling systems.

Performance of I.C Engines: Determination of Indicated power, brake power, frictional power, brake thermal efficiency, mechanical efficiency, indicated thermal efficiency, relative efficiency, and volumetric efficiency, specific fuel consumption based on brake power and indicated power. Heat balance sheet, Morse Test.

UNIT - III:

I.C. Engine Combustion phenomena: Stages of combustion in S.I. Engines- Ignition lag, Flame front propagation and after burning. Abnormal combustion- Pre-ignition and Knocking. Factors affecting Knocking. Stages of combustion in C.I. Engines, Delay period, Period of Uncontrolled Combustion, Period of Controlled Combustion and After Burning. Abnormal Combustion-Knocking. Factors affecting Knocking. Octane and Cetane rating of fuels. Types of combustion chambers of S.I. engines and C.I. engines.

UNIT - IV:

Steam power plant: Working of Carnot and Rankine cycles, cycle analysis, Modified Rankine cycle, Cycle efficiency improvement methods: Reheating and Regeneration.

Steam nozzles: Types of nozzles, Nozzle efficiency, Velocity of steam flowing through the nozzle. Mass of steam discharged from the nozzle, Condition for maximum discharge, Critical pressure ratio. Diameters of nozzle throat and exit for maximum discharge.

UNIT - V:

Steam Boilers: Classification and Working Principles.

Water tube boilers- Babcok & Wilcox and Stirling boilers.

Fire tube boilers- Cornish, Cochran, Locomotive and Lancashire boilers.

High Pressure boilers / Supercritical boilers: La-mont, Benson boiler, Loeffler boiler and Velox boiler. Boiler Mountings and Accessories. Boiler Draught.

Steam Condensers: Jet and Surface condensers, Principle of Operation and Applications.

TEXT BOOKS

1. Ganeshan.V, “Internal Combustion Engines”, Tata McGraw- Hill Education Pvt. Ltd.
2. Rajput. R. K, “Thermal Engineering” Laxmi Publishers.

REFERENCE BOOKS

1. Eastop. T.D.,Mc Conkey. A, “ Applied Thermodynamics for Engineering Technologists”, Pearson Education.
2. Heywood. J.B, “Internal Combustion Engine Fundamentals “, Tata McGraw Education Pvt. Ltd.
3. Ballaney. P.L, “Thermal Engineering”, Khanna Publishers
4. Mahesh M Rathor, “Thermal Engineering” Tata McGraw Education Pvt. Ltd
5. ISI Steam Tables in SI units, Indian Standards Institution, New Delhi, SP: 26-1983.

Course Code	Course Title						Core/Elective
6PC405ME	MANUFACTURING PROCESSES						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	40	60	3

COURSE OBJECTIVES :

It is intended to make the students to :

1. To understand the basic principles of major manufacturing processes such as metal casting, welding and forming of engineering materials.
2. To know the advantages and limitations of each process.
3. To be able to select the optimal process to produce a product.
4. To know the basic principle of advanced forming processes

COURSE OUTCOMES :

After completing the course, the students will be able to

CO1. Describe the concepts of Foundry Technologies consisting of pattern making, mould making, gating design and solidification.

CO2. Discuss the importance of special casting processes, categorize various casting defects and describe the processing of plastics and powder metallurgy concepts.

CO3. Classify and differentiate various Arc welding, Gas welding and Advanced welding processes, discuss their advantages, applications and limitations.

CO4. Differentiate various Solid State welding and Resistance welding processes, discuss their applications, and identify various welding defects.

CO5. Describe various forming processes, sheet metal operations and discuss the importance of unconventional forming processes.

UNIT - I

Casting Process : Casting terms, pattern materials, types of patterns, pattern allowances, colour code for patterns, Moulding sands, core sands, properties of moulding sand and its ingredients, different types of moulding machines, Directional solidification, use of chaplets, chills, gating and risering systems. Melting of metals and alloys.

UNIT - II:

Special Casting Processes: Shell moulding, CO2 moulding, die casting, centrifugal casting, investment or lost wax process; Casting defects, causes and remedies, Inspection and testing of castings.

Processing of Plastics - Extrusion, Injection moulding, Blow moulding and Thermoforming. Introduction to Powder Metallurgy- Process, Production of powders, blending, mixing, compaction techniques and finishing operations employed in powder metallurgy processes.

UNIT - III

Welding Processes: Introduction, Classification of welding processes, principle of gas welding, gas welding equipment and techniques, types of flames and applications, advantages, limitations and applications of gas welding. Arc welding equipment electrode materials and specifications, polarity, types of arc welding.- SMAW, SAW, GMAW, GTAW, PAW, EBW, LBW, Atomic hydrogen welding, principle of Electro slag welding, Thermit welding. Gas cutting, Brazing and Soldering.

UNIT-IV

Solid State Welding Process: Forge Welding, Friction Welding, Friction Stir Welding, Explosive Welding and Ultrasonic welding.

Resistance welding processes - Spot welding, Seam welding, Projection welding, Butt Welding.

Weldability and Welding defects.

UNIT - V

Forming Processes: Cold & Hot working, Process description of Forging, Rolling, Extrusion and Drawing operations.

Sheet Metal Operations: Blanking, Piercing, Bending, Deep drawing, Stretch forming, Spinning.

Advance Forming Processes- High energy rate forming processes such as Explosive forming, Electro- magnetic forming and Electro-hydraulic forming; Rubber pad forming.

TEXT BOOKS

1. P.N. Rao, ?Manufacturing Technology,? Vol. 1, Tata McGraw Hill Publ.
2. J.P.Kaushish, "Manufacturing Processes", PHI Learning Pvt. Ltd.

REFERENCE BOOKS

1. Amitabh Ghosh & Mallick, ?Manufacturing Science?, Assoc. East west Press Pvt. Ltd.
2. Roy A. Lindberg, "Processes and Materials of Manufacture", Pearson Education.
3. Serope Kalpakjian, ?Manufacturing Engineering and Technology?, Pearson Education.
4. George. E. Dieter, "Mechanical Metallurgy", SI Metric Edition McGraw-Hill BookCompany.

Course Code	Course Title						Core/Elective
6PC406ME	FLUID MECHANICS & HYDRAULIC MACHINERY						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Mathematics & Mechanics	3	-	-	-	40	60	3

COURSE OBJECTIVES :

It is intended to make the students to

1. Know various fluid properties, concepts and methods of fluid measurement.
2. Understand the basic concepts and principle of fluid flow.
3. Study different equations of fluid motion and fluid dynamics.
4. Analyze different flow characteristics of laminar flows.
5. Understand the working principle of hydraulic turbines and pumps and their performance.

COURSE OUTCOMES(CO) :

After completing the course, student will be able to:

1. Understand the properties of Fluids and measurement of pressure by various devices.
2. Explain different types of flows and flow measuring devices and apply the energy equations.
3. Analyze the flow between Series and Parallel plates and examine the energy losses in pipes.
4. Understand the working principles of various Pumps and Turbines.
5. Design Impulse and Reaction turbines and evaluate the performance of various turbines.

UNIT – I

Basic Concepts and Properties of Fluid : Definition of Fluid, distinction between solid and fluid, Properties of fluids, density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillary, surface tension, units and dimensions.

Fluid statics : Concept of fluid static pressure, Pascal's Law, absolute, gauge and Vacuum pressures, pressure measurements by piezometer, manometers and pressure gauges.

UNIT - II

Fluid Kinematics : Description of fluid flow, types of flow, Lagrangian and Eulerian approach, velocity field and acceleration, Continuity equation 1D and 3D differential

forms, streamline, streak line, path line, time line, stream tube, stream function, velocity potential function, vorticity, circulation, rotation, flow net.

Fluid Dynamics : Equations of motion, Euler's equation along a streamline, Bernoulli's equation, applications. Venturi meter, Orifice meter, Pitot tube, Impulse-Momentum Equation, buoyancy, submerged bodies.

UNIT - III

Incompressible Fluid Flow : Viscous flow, Shear stress-pressure gradient relationship, laminar flow between parallel plates, Laminar flow through circular tubes (Hagen poiseulle's), Hydraulic and energy gradient lines, total energy line.

Flow through pipes : Darcy- Weisbach's equation, pipe roughness, friction factor, minor losses, flow through pipes in series and parallel, Boundary layer flows, boundary layer thickness, boundary layer separation, drag and lift coefficients.

UNIT - IV

Hydraulic Turbines : Definition and classifications, Pelton turbine, Francis turbine, propeller turbine, Kaplan turbine, working principles, velocity triangles, work done, specific speed, Efficiencies, Unit quantities, performance curves.

UNIT - V

Hydraulic Pumps : Definition and classifications. Centrifugal pump: classification, working principles, velocity triangles, specific speed, efficiency, priming, surging, cavitation in pumps and performance curves.

Reciprocating pump: Classification, working principle, indicator diagram, Air vessels, Separation of pumps

Rotary pumps: working principles of gear and vane pumps.

TEXT BOOKS

1. Modi & Seth "Hydraulics and Fluid Mechanics" – standard book house.
2. Bansal, R.K., "Fluid Mechanics and Hydraulics Machines", (5th edition), Laxmi publications (P) Ltd. Delhi.

REFERENCE BOOKS

1. Streeter, V.L., and Wylie, E.B., "Fluid Mechanics", McGraw-Hill.
2. White, F.M., "Fluid Mechanics", Tata McGraw-Hill, 5th Edition, New Delhi.
3. Som, S.K., and Biswas, G., "Introduction to fluid mechanics and fluid machines", TataMcGraw- Hill, 2nd edition.
4. Kumar D. S., "Fluid Mechanics and Fluid Power Engineering", S. K. Kataria & Sons.

Course Code	Course Title						Core/Elective
6PC407ME	KINEMATICS OF MACHINES						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
L	T	D	P				
Engg Mechanics	3	1	-	-	30	70	4

COURSE OBJECTIVES:

It is intended to make the students to :

1. Understand the basic terminology & principles of kinematics related to machines.
2. Study functioning of quadric chains & their inversions.
3. Study useful mechanisms & understand their functioning.
4. Study analysis of position, velocity & acceleration of parts in a machine.
5. Study conversion of uniform rotary motion to specified linear & oscillating motion.
6. Study gears for positive motion transmission.

COURSE OUTCOMES :

After completing the course, student will be able to:

1. Identify links & joints, determine mobility & explain motion of a connected system oflinks.
2. Analyse motion of planar mechanisms & their equivalent chains.
3. Identify & explain the applications of commonly used mechanisms.
4. Solve problems involving velocity & acceleration of planar mechanisms with givendimensions at specified positions.
5. design gear trains for specified speed ratios and cams & followers for specified motionprofiles.

UNIT - I :

Kinematic principles & inversions

Terminology: Link, Joint, Kinematic Pair, Kinematic Chain, Mechanism & Machine, Inversions of Quadric, Single Slider Crank & Double Slider Crank Chains. Analysis: Kutzbach & Grubler criterion, Grashof's Law, Coupler Curves, Robert's Law Synthesis: Type, Number & Dimensional Synthesis of Quadric Planar Mechanisms.

UNIT - II:

Application of Mechanisms

Straight Line Mechanisms: Watt, Tchebicheff, Robert, Scott Russel, Grasshopper, Paucellier, Hart, Parallel Linkages: Parallel Ruler, Lazy Tongs, Universal Drafting Machine Pantograph, Geneva Mechanism, Hooke's joints, Belt Drives vs Chain Drives Condition for Correct Steering: Applications in Davis & Ackerman Steering Gear Mechanisms.

UNIT - III :

Analysis of Planar mechanisms : Velocity Analysis by Relative Velocity & Instantaneous Centre Methods, Angular Velocity theorem. Acceleration Analysis by Graphical Method - Centripetal, Tangential & Coriolis Components, Body & Space Centrodes, Axodes.

UNIT - IV:

Cams : Types of Cams & Followers, Pressure Angle, Displacement, Velocity, Acceleration, Jerk & Snap (SVAJ) Diagrams for Follower Motion, Analysis of Uniform Motion, Parabolic Motion, Simple Harmonic Motion & Cycloidal Motion Profiles. Graphical Synthesis of Planar Cams with Knife Edge, Roller & Flat Faced Followers. Eccentric Circle-cam with a Translating Roller Follower.

UNIT - V:

Gears : Classification & Terminology, Law of Gearing, Comparison of Involute & Cycloidal Profiles, Interference of Involute Gears, Minimum Number of Teeth to Avoid Interference, Contact Ratio, Pressure Angle, Sliding Velocity.

Gear Trains: Simple, Compound, Reverted, & Epicyclic Gear Trains. Applications in Clock, Gearbox & Differential.

TEXT BOOKS

1. "Theory of Machines" by S. S. Rattan - McGraw-Hill Publication.
2. "Kinematics of Machines" by V P Singh - Dhanpath Rai & Co.

REFERENCE BOOKS

1. "Theory of Machines" by V P Singh - Dhanpath Rai & Co.
2. "Kinematics and Dynamics of Machinery" by Norton RL - McGraw-Hill Publication.
3. "Theory of Machines and Mechanisms" by J. E. Shigley - McGraw-Hill Publications.
4. "Theory of Machines" by Thomas Bevan - Pearson Education.
5. "Theory of Mechanisms and Machines" by Amitabha Ghosh & Ashok Kumar Mallik - EastWest Press Pvt. Ltd.
6. "Kinematics with Microstation" - ICT Tools - https://www.youtube.com/Ujjwal Rane.

Course Code	Course Title	Core/Elective					
6MC402HS	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE (Common for all branches)	Mandatory Course					
		L	T	P/D	Credits	CIE	SEE
		2	0	0	0	40	60

COURSE OBJECTIVES :

1. To reinforce the students understanding with the pan-Indian heritage in terms of culture, traditions and knowledge.
2. To impart understanding of the importance of the roots of the traditional knowledge and types.
3. To impart basic knowledge on the evolution of the multiple languages that highlight India's diversity.
4. To know Indian Languages,Philosophies, Religion, Literature, Fine arts and Technology.
5. To explore the Ancient Science & Scientists, in Medieval and Modern India; the education system.

COURSE OUTCOMES :

Student will be able to -

1. Understand the concepts of Indian culture and Traditions and their importance.
2. Distinguish the Indian languages and literature
3. Learn the philosophy of Ancient, Medieval and Modern India.
4. Acquire the information about the fine arts in India
5. Know the contribution of scientists of different eras, interpret the concepts and the importance to protect Intellectual property of the nation.

UNIT - I

- Introduction to Culture: Civilization, Culture and Heritage.
- General characteristics of culture, importance of culture in human literature.
- Indian Culture, Ancient India, Medieval India, Modern India.

UNIT-II

Indian Languages, Culture and Literature.

Indian Languages and Literature-I: -the evolution and role of Sanskrit, Prakrit, significance of scriptures to current society, Indian philosophies, other Sanskrit literature, literature of south India (Tamil).

Indian Languages and Literature-II: Northern Indian languages & literature.

UNIT - III

Religion and Philosophy: Religion and Philosophy in Ancient India (Buddhism, Jainism and Shatdarshanas), Religion and Philosophy in Medieval India, Religious reform movements in Modern India (Brahma Samaj & Arya Samaj).

UNIT - IV

Fine Arts in India (Art, Technology& Engineering): Indian Painting, **Indian handicrafts Music:** Divisions of Indian classical music, modern Indian music Dance and Drama.

Indian Architecture- Ancient (Harrappa and Mohenjodaro, Buddhist sculpture, Ashokan rock cut pillars, Iron Pillar of Mehrauli); Medieval- Bruhadeshwara temple, Ramappa Temple, Vijayanagara, Hampi) and Modern Architecture Science and Technology in India :

Development of science in Ancient, Medieval and Modern India. Their relation in terms of modern scientific perspective. Science and Scientists of Ancient, Medieval and Modern India Protection of traditional knowledge, significance, value to economy: Role of government in protection of indigenous knowledge and technology; protection of traditional knowledge bill, 2016.

UNIT - V

Education System in India :

- Education in Ancient, Medieval and Modern India
- Aims of education- Universities in Ancient India, Women Education in Ancient, Medieval and Modern India, National Education Policy-2020.

TEXT BOOKS :

1. Indian Knowledge Systems (2 Vols-Set),Kapil Kapoor and Avadhesh Kumar Singh, ISBN 10: 8124603367.
2. Basanta Kumar Mohanta and Vipin K. Singh, Traditional Knowledge System and Technology in India, Book Originally published: 2012 Publication.ISBN 10: 8177023101ISBN Nitin Singhania,Indian Art and Culture, 4th Edition, ISBN: 9354601804.
3. S. Narain, Education and Examination Systems in Ancient India, written/ authored/edited by S. Narain', published 2017, English-Hardcover, ISBN 9789351282518 publisher: Kalpaz Publications.

REFERENCES:

1. Science in Samskrit, Samskrita Bharati, Published by Samskrita Bharati, New Delhi, India, 2007; ISBN 10: 8187276339 / ISBN 13: 9788187276333.
2. 1.7-Position paper, National Focus Group on Arts, Music, Dance and Theatre NCERT, March 2006, ISBN 81-7450-494-X, NCERT, New Delhi.
3. Founders of Sciences in Ancient India,Satya Prakash, Vijay Kumar Publisher, New Delhi.
4. Essentials of Indian Philosophy,M. Hiriyanna, Motilal Banarsidass Publishers, New Delhi.
5. NCET Books from VI to XII standards.
6. The social and economic conditions of Medieval India. Chopra, Puri & Das.

Course Code	Course Title						Core/Elective
6ES453CS	PYTHON PROGRAMMING LAB						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Experience with a high level language (C/C++, Java, MATLAB) is suggested	-	-	-	2	40	60	1

COURSE OBJECTIVES:

1. To learn how to design and program using lists, tuples, and dictionaries.
2. To learn how to use indexing and slicing to access data in Python programs.
3. To learn structure and components of a Python and to read and write files.
4. To learn how to design object-oriented programs with Python classes and Exception handling techniques.
5. To learn how to design and build the GUI applications using python.

COURSE OUTCOMES:

1. Develop solutions to simple computational problems using Python programs.
2. Solve problems using conditionals and loops in Python.
3. Develop Python programs by defining functions and calling them.
4. Use Python lists, tuples and dictionaries for representing compound data.
5. Develop Python programs for GUI applications.

LIST OF EXPERIMENTS :

1. Develop program to demonstrate different number datatypes in python.
2. Develop program to understand the control structures of python.
3. Develop program on String manipulation.
4. Develop program to perform various operations on files.
5. Develop programs to learn different types of structures (list, dictionary, tuples) in python.
6. Develop programs to learn concept of functions scoping, recursion and list mutability
7. Develop program to demonstrate classes and OOP principles
8. Develop programs for data structure algorithms using python – searching, sorting and hash tables
9. Develop programs to understand working of exception handling and assertions
10. Draw graphics using Turtle.
11. Develop event driven GUI programs.
12. Develop Program for demonstration client server communication.

Course Code	Course Title						Core/Elective
6PC453ME	APPLIED THERMODYNAMICS LAB						Core
Prerequisites	L	T	D	P	CIE	SEE	Credits
-	-	-	-	3	40	60	1

COURSE OBJECTIVES :

It is intended to make the students to :

1. To understand applications of thermal engineering concepts through experimentation.
2. To provide knowledge in testing of properties of fuels and lubricating oils.
3. To demonstrate and conduct experiments, Interpret and analyse data and report results of IC engine testing.

COURSE OUTCOMES :

After completing the course, student will be able to :

1. Perform experiments to find the efficiency of Petrol and Diesel engines.
2. Find the properties of unknown fuels/lubricants.
3. Perform experiments on CI and SI engines.
4. Perform experiments on Reciprocating Air Compressor.

LIST OF EXPERIMENTS :

1. To determine volumetric efficiency, isothermal efficiency and mass flow rate of a two stage reciprocating air compressor.
2. To determine valve timing diagram of a Petrol/Diesel engine.
3. To determine port timing diagram of a Petrol/Diesel engine.
4. To conduct performance test on single cylinder Diesel engine.
5. To conduct heat balance test on a Diesel engine.
6. To conduct Morse test on multi cylinder Petrol engine.
7. To conduct performance test on multi cylinder Petrol engine.
8. To conduct performance test on a two-stroke Petrol engine.
9. To conduct performance test on multi cylinder Diesel engine.
10. To study the performance of a Petrol engine under different compression ratios.
11. Determination of viscosity of lubricating oil.
12. Determination of flash and fire points of a fuel.
13. Study of Boiler Models.

Note : At least ten experiments should be conducted in the Semester

Course Code	Course Title						Core/Elective
6PC454ME	MANUFACTURING PROCESS LAB						Core
Prerequisites	L	T	D	P	CIE	SEE	Credits
Engg. Workshop	-	-	-	3	40	60	1

COURSE OBJECTIVES:

It is intended to make the students to :

1. To gain knowledge and skill in various manufacturing processes such as casting, welding& forming.
2. To understand and perform operations like pattern making, sand testing and casting.
3. To join metal pieces by various welding techniques and gain hands on experience.
4. To understand the working principle and produce some components by various metal forming techniques

COURSE OUTCOMES:

After completing the course, student will be able to:

1. Conduct experiments and gain hands-on experience on various processes in foundry, welding, forging, forming and plastic manufacturing technologies.
2. Demonstrate the understanding of the theoretical concepts of above technologies while working in small groups.
3. Demonstrate writing skills through clear laboratory reports
4. Identity the defects / imperfections and discuss their causes and suggest remedies to eliminate them.
5. Transfer group experience to individual performance of exercises and demonstrate effective oral communication skills.

LIST OF EXPERIMENTS

Foundry

1. Producing different types of patterns considering draft, shrinkage and machining allowances.
2. Green sand mould making processes with complete gating and risering systems.

3. Testing of moulding sand properties.
4. Melting and pouring of aluminium to produce casting.

Welding

I. Evaluation of strength and hardness of
    1. Butt Joint prepared by gas welding using different types of flames.
    2. Lap joint by resistance welding process.
    3. V-Joint by Arc welding process.

II. Exercises using TIG and MIG welding processes.

III. Performing Brazing and Soldering operations.

Forming:

1. Evaluation of formability using Erichsen cupping test
2. Performing drawing operation on different materials (ex. MS, Cu, Al, etc)
3. Performing blanking and piercing operations using hydraulic/fly presses.
4. Manufacturing of a simple component using Plastic Injection moulding machine
   Manufacturing of a simple component using Plastic Blow moulding machine

Note: At least ten experiments should be conducted in the Semester

Course Code	Course Title						Core/Elective
6PC455ME	FLUID MECHANICS AND HYDRAULIC MACHINERY LAB						Core
Prerequisites	L	T	D	P	CIE	SEE	Credits
-	-	-	-	3	40	60	1

COURSE OBJECTIVES:

It is intended to make the students to understand :

1. The working of pumps of different kinds and their behaviour.
2. The working of turbines of different kinds and their behaviour.
3. The theory of working of various flow measuring devices and their utility in industry.

COURSE OUTCOMES:

After completing the course, student will be able to:

1. Practice and experiment on different types of turbines and analyse their performance at rated and off design conditions.
2. Investigate through experimentation different types of pump models and estimate their performance.
3. Apply the principle of different flow measuring instruments and their adoptability to the industry.
4. Develop the hydraulic circuits to cater the needs of the industry.

LIST OF EXPERIMENTS:

1. To conduct performance test and draw the characteristic curves of Self Priming pump.
2. To conduct performance test and draw the characteristic curves of Centrifugal pump.
3. To conduct performance test and draw the characteristic curves of Reciprocating pump.
4. To conduct performance test and draw the characteristic curves of Gear pump
5. Study of Impact of Jets on Vanes.
6. To conduct performance test and draw the characteristic curves of Pelton Wheel.
7. To conduct performance test and draw the characteristic curves of Francis Turbine.
8. To conduct performance test and draw the characteristic curves of Kaplan Turbine.
9. To determine coefficient of discharge of Venturi meter.
10. To determine coefficient of discharge of orifice meter.
11. To Study Hydraulic Circuits.
12. To Study pneumatic Circuits.

Note: At least ten experiments should be conducted in the Semester