BACHELOR OF TECHNOLOGY
FOR ADMISSION BATCH 2023-24
CIVIL ENGINEERING
SECOND YEAR (THIRD SEMESTER)

Sl. No.	Category	Course Code	Course	Contact Hrs. L-T-P	Credit	University Marks	Internal Evaluation
Subject (Theory)							
1	BS	HSBS2001	Mathematics - III	3-0-0	3	100	50
2	PC	MEPC2001	Mechanics of Solids	3-0-0	3	100	50
3	PC	CIPC2002	Engineering Survey	3-0-0	3	100	50
4	PC	CIPC2003	Fluid Mechanics	3-0-0	3	100	50
5	PC(ACC)	PCAC2001	Python Programming	3-0-0	2	100	50
		PCAC2002	Data Science Foundations				
		PCAC2003	Web and Application Development				
		PCAC2004	Cloud Computing Foundation				
		PCAC2005	Programming Internet of Things				
		PCAC2006	Robotics : Motion Planning				
		PCAC2007	IT Fundamentals for Cybersecurity - I				
6	HS	HSHS2001	Engineering Economics	3-0-0	2	100	50
		HSHS2002	Organizational Behaviour				
Subject (Sessional / Practical)							
7	PC	CIPC2201	Building Drawing Practice	0-0-3	1.5	-	100
8	PC	CIPC2202	Fluid Mechanics Lab.	0-0-3	1.5	-	100
9	PC	CIPC2203	Material Testing Lab.	0-0-3	1.5	-	100
10	PC(ACC)	PCAC2201	Python Programming Lab.	0-0-3	1.5	-	100
		PCAC2202	Data Science Foundations Lab.				
		PCAC2203	Web and Application Development Lab.				
		PCAC2204	Cloud Computing Foundation Lab.				
		PCAC2205	Programming Internet of Things Lab.				
		PCAC2206	Robotics : Motion Planning Lab.				
		PCAC2207	IT Fundamentals for Cybersecurity - I Lab.				
			Total	**18-0-12**	**22**	**600**	700

Note: Click here to view/download the syllabus of the subjects.

CIPC2002 ENGINEERING SURVEY (3-0-0)

Course Objectives:

1. Ability to apply different methods of surveying suitable for a location and application
2. Ability to use different conventional and modern surveying instruments
3. Learn about referencing system, horizontal and vertical control for topographic mapping.
4. Understand different problems, issues and errors associated with survey data
5. Ability to record, analyze survey data, and check, remove and distribute survey errors.

Module-I

Linear measurements and chain surveying: Definition of surveying, classification of surveys, scales, types of chains and tapes, chaining and ranging, principles of chain survey, instruments, applications, errors and corrections, obstacles in chaining.

Module-II

Compass Traversing: Measurement of bearing, computation of angles from bearings, designation of bearings, fore bearing and back bearing, prismatic compass, principles of compass survey, local attraction and corrections, compass traverse and adjustments.

Module- III

Levelling and contouring: Principle, levelling instruments, dumpy level, classification of levelling, booking and reducing levels, profile and reciprocal levelling, curvature and refraction corrections, bubble tube and its sensitiveness, levelling difficulties, definition of contouring, contour interval, characteristics of contours, direct and indirect methods of contouring, interpolation of contours, contour gradient, uses of contour maps.

Module- IV

Theodolite Survey: Use of theodolite, temporary adjustment, measuring horizontal and vertical angles, theodolite traversing, included angles from bearings, fundamental lines and desired relations, errors in theodolite work.

Module- V

Modern Surveying Instruments: Electronic Distance Measurement, Corrections to measurement, Digital Theodolite, Total Stations, Global Positioning System, Introduction to Remote Sensing and GIS (Brief Introduction).

Course Outcome:

After this course the student shall:

- Apply the concepts of linear distance measurement for establishing the position of a point on ground.
- Able to find the angular measurement.

- Apply the concepts of height measurement to establish the vertical coordinate of a point on earth and prepare the contour map.
- Able to use theodolite to establish the spatial coordinates of a point on ground.
- Understand and apply modern equipment and technique for engineering survey.

Text Books:

1. Punmia, B.C., Jain, A.K. and Jain, A.K., Surveying Vol. I and II, Laxmi Publications (2016)
2. Surveying Vol-1 by R Agor, Khanna Publishers

Reference Books:

1. Chandra, A.M., Surveying Problem Solving, New Age International
2. Subramanian, R., Surveying and Leveling, Oxford University Press

CIPC2003 FLUID MECHANICS (3-0-0)

Course Objectives:

1. Explain about fluid properties and pressure measurement.
2. Analyze hydrostatic forces on surfaces and study of buoyancy and flotation.
3. Revise basics of kinematics and dynamics of fluid flow.
4. Observe flow through pipes and computation of coefficients of orifices and mouthpieces.
5. Differentiate between laminar and turbulent flows through pipe.

Module-I

Properties of fluids: Fundamental definitions, Density, specific weight, specific volume, specific gravity, viscosity, vapor pressure, compressibility and elasticity, surface tension and capillarity.

Fluid pressure and its measurement: Fluid pressure at a point, variation of pressure in a fluid, Pascal's law, atmospheric absolute, gauge and vacuum pressure, measurement of pressure.

Module-II

Hydrostatic pressure on submerged surface: Total pressure and centre of pressure, total pressure on plane surface(horizontal, vertical, inclined, curved),centre of pressure on vertical and inclined plane surface, pressure diagram, practical application of total pressure and centre of pressure(in dam, gate and water tank)

Buoyancy and Flotation: Buoyancy, buoyant force and centre of buoyancy, metacenter and metacentric height, stability of submerged and floating body, determination of metacentric height(experimental and theoretical)

Module-III

Kinematics of fluid flow: Introduction, velocity of fluid particles, types of fluid flow, flow pattern, basic principle of fluid flow, continuity equation, acceleration of a fluid particle,rotational and irrotational motion, circulation and vorticity, velocity potential, stream function, streamlines, equipotential lines, flow net, its uses and limitations

Dynamics of fluid flow: Introduction,forces acting on fluid in motion,Euler's equation ofmotion,Bernoulli's equation of motion,Kinetic energy correction factor,Bernoulli's equation for acompressible fluid,pressure velocity relationship and its application (venture meter,orificemeter,nozzle meter),pitot tube,free liquid jet,vortex motion(free and forced)

Module-IV

Flow through pipes: Introduction, types of flow, laws of fluid friction(laminar flow and turbulent flow),Formulae for head loss due to friction in pipes(DarcyWeisbachequation,Chezy'sformula,Manning's formula, Hazen-William's formula),other energy losses in pipe,Hydraulic grade line and energy grade line,flow through long pipes, flow through pipes (series,parallel,equivalent,by-pass,branched,syphonic),time of emptying a reservoir through pipe, transmission of power through pipe, flow through nozzle at the end of pipe, water hammer in pipe

Orifices and mouthpieces: Introduction, classification of orifices, flow through an orifice, hydraulic coefficients (velocity, contraction and discharge), flow through large orifices, classification of mouthpieces

Module-V

Laminar flow through pipes:Introduction,relation between shear pressure gradient, steady laminarflow in circular pipe,laminar flow through inclined pipes,laminar flow through annulus, laminar flowparallel plates (both plates at rest, one plate at rest and other moving),variation of friction factor f forlaminar flow, laminar flow around sphere, measurement of viscosity(viscometer)

Turbulent flow through pipes: Introduction, shear stress, hydro dynamically smooth and roughboundaries, velocity distribution for turbulent flow in hydro dynamically smooth and rough pipes,criteria for smooth and rough pipes, velocity distribution for turbulent flow in terms of mean velocityfor smooth and rough pipes, resistance to flow of fluid in smooth and rough pipes,criteria for hydrodynamically smooth and rough pipes,variation of friction factor for commercial pipes).

Course Outcome:

After completion of this course a student shall be able to:

- Explain about fluid properties and pressure measurement.
- Analyze hydrostatic forces on surfaces and study of buoyancy and flotation.
- Revise basics of kinematics and dynamics of fluid flow.
- Observe flow through pipes and computation of coefficients of orifices and mouthpieces.
- Differentiate between laminar and turbulent flows through pipe.

Text Books:

1. Hydraulics and Fluid Mechanics including Hydraulic Machines by P.N.Modi and S.M. Seth, Standard Book House.

Reference Books:

2. Fluid mechanics by A.K. Jain, Khanna Publishers.
3. Engineering Fluid Mechanics by K.L. Kumar, S. Chand & Co.
4. Fluid Mechanics by V.L. Streeter, MGH

CIPC2201 BUILDING DRAWING PRACTICE (0-0-3)

- Understanding drawing requirements and symbols in building drawing as per IS 962:1967

- Detailing of different building components: footing, masonry, stair case, and arches, etc.

- Development of plan, elevation, side view of 2/3 bed room residential/office building.

- Detailing RCC beams, columns and slabs, and preparing bar bending schedule.

- Detailing of steel roof trusses and connections.

- Any live project on drawing and detailing of Residential/Institutional building.

Text Books:

Civil Engineering Drawing by: M. Chakraborti

Reference Books:

Building Planning and Drawing by N. Kumara Swamy and A. Kameswara Rao, Charotar Publisher.

CIPC2202 FLUID MECHANICS LABORATORY (0-0-3)

1. Determination of Metacentric Height
2. Proof of Bernoulli's Theory
3. Determination of Coefficient of Discharge for V-notch
4. Determination of Coefficient of Discharge for Orifice meter
5. Determination of Coefficient of Discharge for Venturimeter
6. Determination of Reynold'sNumber
7. Determination of Darcy-Weisbach friction factor for pipe flow.
8. Study of Moody's chart for pipe flow.
9. Determination of losses due to bends, fittings and elbows in pipes
10. Study of free vortex and forced vortex.

CIPC2203 MATERIAL TESTING LABORATORY (0-0-3)

Tests on cement:

Determination of Fineness modulus by sieve analysis and/or by air permeability method, standard consistency, setting times, soundness, specific gravity, compressive strength.

Tests on Aggregates:

Sieve analysis of fine aggregate and coarse aggregates for determination of fineness modulus and grain size distribution, determination of water absorption and specific gravity of fine aggregate and coarse aggregates, bulking of sand, crushing value of coarse aggregates

Tests on Steel:

Tensile strength of mild steel and HYSD Bars.

Tests on Bricks:

Determination of shape, size and Water absorption of Bricks

Tests on Concrete:

Compressive strength, flexural strength and split tensile strength of concrete

HSBS2001 MATHEMATICS-III (3-0-0)

Module 1: Laplace Transforms (8 Hours)
Laplace transforms, inverse transforms, linearity, shifting, transforms of derivatives and integrals, solution of ODEs, unit step function, Dirac's delta function, differentiation and integration of transforms, convolution, integral equations.

Module 2: Fourier series & Applied PDE's (8 Hours)
Fourier series: Euler's formula, 2π and arbitrary periodic functions, even and odd functions.
Elementary PDE's: Method of separation of variables (simple problems). One dimensional wave equation: solution by separation of variables, One dimensional heat equation: solution by Fourier series.

Module 3: Basic Probability (8 Hours)
Axiomatic definition of probability, Basic properties, conditioning and independence, Random variables (discrete and continuous), probability mass and density functions, cumulative distribution functions, moments of random variables, mean and variance.

Module 4: Probability Distributions (8 Hours)
Discrete Probability distributions: Binomial, Poisson and hyper-geometric distributions. Continuous Probability distributions: exponential, uniform and normal distributions.

Module 5: Applied Statistics (8 Hours)
Random sampling, estimation of parameters, maximum likelihood estimation, confidence intervals. Regression and correlation analysis: fitting of straight lines (method of lest squares), correlation coefficient with basic properties.

Text Books:
1. Advanced Engineering Mathematics by E. Kreyszig, John Willey & Sons Inc. 10th Edition.
2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers & Keying Ye, "Probability & Statistics for Engineers & Scientists", Eighth Edition, 2007, Pearson Education Inc., New Delhi.

Reference Books:
1. Ordinary and Partial Differential equations by J. Sinha Roy and S. Padhy, Kalyani Publishers.
2. Higher Engineering Mathematics by B. V. Ramana, McGraw Hill Education.
3. Engineering Mathematics by Pal and S. Bhunia, Oxford Publication.
   Stochastic Processes, 2nd Edition by Roy D. Yates, Rutgers and David J. Goodman, John Wiley and Sons, INC.

HSHS2001 ENGINEERING ECONOMICS (3-0-0)

Objectives:
To provide basic concept of micro and macro economics, engineering economics and their application in engineering economy. Further, to develop the ability to account for time value of money using engineering economy factors and formulas.

Module - I (05 hours)
Engineering Economics- Nature, Scope, Basic problems of an economy, Micro Economics and Macro Economics.
Demand - Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Elasticity of demand & its measurement (Simple numerical problems to be solved), Demand Forecasting Meaning
Supply-Meaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, Determination of market equilibrium (Simple numerical problems to be solved).

Module - II (O8 hours)
Production - Production function, Laws of returns: Law of variable proportion, Law of returns to scale
Cost and Revenue Concepts - Total Costs, Fixed cost, Variable cost, Total revenue, Average revenue and Marginal revenue, Cost-Output Relationships in the Short Run, and Cost-Output Relationships in the Long Run, Analysis of cost minimization.

Module III (08 hours)
Market - Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved).

Module - IV (12 hours)
Time Value of Money- Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence.
Evaluation of Engineering Projects -Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for publicprojects.
Depreciation- Depreciation of capital assert, Causes of depreciation, Methods of calculating depreciation - Straight line method, Declining balance method, SOYD method, After tax comparison of project

Module V (06 Hours)

Inflation-Meaning of inflation, types, causes, measures to control inflation.
National Income-Definition, Concepts of national income, Method of measuring national income.
Banking -Commercial bank. Functions of commercial bank, Central bank, Functions of Central Bank.

Books:
1.   Principles of Economics by Deviga Vengedasalam and Karaunagaran Madhavan, Oxford
2.   Riggs, Bedworth and Randhwa, "Engineering Economics", McGraw Hill Education India
3.   C. S. Park, Contemporary Engineering Economics, 6th Edition, Pearson Education, 2015.
4.   Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson
5.   R.Paneer Seelvan, " Engineering Economics", PHI
6.   Ahuja,H.L., "Principles of Micro Economics" , S.Chand & Company Ltd
7.   Jhingan,M.L., "Macro Economic Theory"
8.   Macro Economics by S.P.Gupta, TMH

Course Outcomes of Engineering Economics

At the end of the course the students will be able to

CO1   Remembering : Define the basic concept of micro and macro economics, engineering economics and their application in engineering economy.

CO2   Understanding : Evaluate numerically the effects of changes in demand and supply on price determination of products and services.

CO3   Analyze : the macroeconomic environment and financial systems of the country and its impact on business, society and enterprise.

CO4   Develop : the ability to account for time value of money using engineering economy factors and formulas.

CO5   Apply: knowledge of mathematics, economics and engineering principles to solve engineering problems and to analyze decision alternatives in engineering projects considering upon depreciation, taxes and inflation.

MEPC2001 MECHANICS OF SOLID (3-0-0)

Module–I(08Hours)

Stress and Strain: Definition of stress, stress tensor - normal and shearing stresses in axially loaded members. Normal and shearing strains - stress-strain relationship - Generalized Hooke's Law - Poisson's ratio - relationship between material properties of isotropic materials - stress-strain diagram for uniaxial loading for ductile and brittle materials,strain gauges and rosettes, testing of materials with universal testing machine.Composite bars in tension and compression, temperature stresses.

Module–II(06Hours)

Two Dimensional State of Stress and Strain:Principalstresses,principalstrainsandprincipalaxes,calculationofprincipalstressesfromprincipalstrains, Mohr's Circle, Stressesinthincylinderandthinspherical shellsunderinternalpressure.

Module –III(08 Hours)

Shear Force and Bending Moment Diagram: For simple beams, support reactions for staticallydeterminant beams, relationship between bending moment and shear force, shear force and bendingmomentdiagrams.
Pure bending: Theory of initially straight beams, distribution of normal and shear stress, beams of twomaterials.Deflectionof beamsbyintegrationmethodandareamomentmethod.

Module – IV(04Hours)

Torsionofsolidcircularshafts,twistingmoment,strengthofsolidandhollowcircularshaftsand strength ofshaftsincombinedbendingandtwisting, Closed coiled helical springs.

Module – V(04Hours)

Bucklingofcolumns: Euler'stheoryofinitiallystraightcolumnswithvariousendconditions,Slenderness Ratio, Eccentricloadingofcolumns.Columnswithinitialcurvature.

Course Outcomes

Upon completion of the course, students will be able to:

CO1   Gain a fundamental understanding of the concepts of stress and strain by analysis ofsolids and structures.

CO2   Study engineering properties of materials, force-deformation, stress-strainrelationship & learn fundamental principles of equilibrium, compatibility, and force deformation relationship in linear solids and structures.

CO3   Analyze determinate and indeterminate axial members, torsional members, andbeams, and determine axial forces, torque, shear forces, and bending moments.

CO4   Learn the fundamental concepts of flexibility method,and stiffness method as applied to problems involving statically determinate andindeterminate axial and torsional members, and beams.

CO5   Analyze and design thin, thick cylinders and springs and buckling in columns.

TextBooks:

1. Strengthofmaterials,G. H. Ryder,McMillanIndiaLtd.
2. ElementsofStrengthofMaterials,S. P.Timoshenko, D.H.Young, East WestPress Pvt.Ltd.

ReferenceBooks:

1. Introductionto solidmechanics,H.Shames, Prentice HallIndia, NewDelhi
2. Engineeringmechanics of solid, E.P. Popov,Prentice Hall India, New Delhi
3. Mechanics of materials by Beer and Johnston, Tata McGraw Hill.

PCAC2005 PROGRAMMING INTERNET OF THINGS (3-0-0)

OVERALL COURSE OBJECTIVES: To empower students with a comprehensive understanding of IoT and Embedded Systems, Arduino and Raspberry Pi platforms, and C and Python programming. This will enable them to create innovative IoT designs and products and understand how these devices interact with the physical world. They will also learn debugging techniques and network protocols essential for embedded systems.

Module 1: <u>Introduction to the Internet of Things and Embedded Systems</u> [12 Hours]

This course explores the significant role of the "Internet of Things" (IoT) in the modern world and its future trends. It defines what IoT and embedded systems are, describes their impact on society, and enumerates their components. The lessons cover hardware and software interactions in an IoT device and the role of an operating system in supporting this software. The course highlights key components of networking, including an understanding of how to connect devices to the Internet, the structure of the Internet, and the meaning of a "network protocol". It also explains Mobile Ad-Hoc Networks (MANETs) in relation to IoT. While beneficial, this course does not include discussion forums.

Sub-Topic
Embedded Systems
Hardware and Software
Networking and the Internet
What Is the Internet of Things (IoT)?

Formative Assessments:
4 quizzes and 4 peer-review assignments.

Module 2: <u>The Arduino Platform and C Programming</u> [13 Hours]

This course provides in-depth knowledge about the Arduino platform, including the physical board, libraries, and the integrated development environment (IDE). It explores the role and usage of shields and touches on programming the Arduino using C code. The lessons delve into elements like reading board schematics, installing the Arduino IDE, understanding the significance of libraries, and running a program. The course provides a comprehensive understanding of C variables, types, common operators, conditionals, loops, functions, and the implications of global variables. Additionally, the course covers the Arduino build process, the role of tools in the IDE, the structure of an Arduino sketch, and accessing pins on the Arduino. It also covers embedded software debugging, common debugging architectures for embedded systems, and the UART Serial communication protocol. The course does not include discussion forums.

Sub-Topic
Arduino Environment
Arduino Programs
C Programming
Basic C Operators
Arduino Sketches

Formative Assessments:
4 quizzes and 4 peer-review assignments.

Module 3: <u>The Raspberry Pi Platform and Python Programming for the Raspberry Pi</u> [19 Hours]

The Raspberry Pi is a small, affordable single-board computer that you will use to design and develop fun and practical IoT devices while learning programming and computer hardware. In addition, you will learn how to set up the Raspberry Pi environment, get a Linux operating system running, and write and execute some basic Python code on the Raspberry Pi. You will also learn how to use Python-based IDE (integrated development environments) for the Raspberry Pi and how to trace and debug Python code on the device.

Sub-Topic
Raspberry Pi Processor
Operating System Benefits
Raspberry Pi Configuration
Navigating the Filesystem
Linux Graphic User Interface
Python on Raspberry Pi

Formative Assessments:
4 quizzes and 4 peer-review assignments.

LEARNING OUTCOMES: On successful completion of the course the students shall be able to:

1. Understand and define the key concepts of "Internet of Things" and its impact on society, focusing specifically on design considerations and components of IoT devices.

2. Master the composition and firmware programming of the Arduino development board, as well as the usage of "shields" and libraries.

3. Gain the ability to compile and run a program using C language, understanding variables, types, and operators specifically relevant to Arduino sketches.

4. Acquire knowledge on the Raspberry Pi setup and operation, including executing a Linux operating system.

5. Develop expertise in writing and executing basic Python code on Raspberry Pi, also learning to use Python-based IDEs and debugging Python code.

6. Understand the fundamental aspects of networking, including network protocol, structure of the Internet, and their specific implications in IoT devices.

PCAC2205 PROGRAMMING INTERNET OF THINGS LAB. (0-0-3)

Module Title	Lab Name	Details
Introduction to the Internet of Things and Embedded Systems	Wireshark	Download and install Wireshark on a computer. Start Wireshark and start a packet capture. Open a browser on your computer and go to any webpage. Stop the Wireshark packet capture and examine it to find the first TCP packet which is recorded and whose source is your computer. Find the port number, P, used on your computer. Use the Wireshark filter to show only the messages to/from this port (tcp.port == P). Select the message and make sure that the Packet Details Pane is visible and showing the following information: 1) the Internet Protocol header with the Src and Dst IP addresses, and 2) the Transmission Control Protocol header with the Src Port number and Dst Port numbers. Print the screen image and submit it for grading. Also, submit one page which states your machine's IP address at the time of capture, and the port number that you found being used for the TCP connection on your computer.
The Arduino Platform and C Programming	Install Arduino IDE	install the Arduino IDE on your computer, compile the "Blink" example, upload the example to the board, and ensure that the LED blinks.
	Program to compute Fibonacci sequence	Write a program in C that computes and prints out the first six digits in the Fibonacci sequence.
	Arduino Blink	Write a program that causes the built-in LED connected to pin 13 on the Arduino to blink, alternating between fast blinks and slow blinks. The LED should blink 5 times quickly and then it should blink 5 more times slowly. The LED should continue to blink in this alternating fashion for as long as the Arduino receives power.
	Serial on Arduino	Write a program that allows the user to control the LED connected to pin 13 of the Arduino. When the program is started, the LED should be off. The user should open the serial monitor to communicate with the Arduino. If the user sends the character '1' through the serial monitor then the LED should turn on. If the user sends the character '0' through the serial monitor then the LED should turn off.
The Raspberry Pi Platform and	Raspberry Pi setup	Setup your Raspberry Pi by usingNOOBSto install Raspbian on the micro SD card. Boot your Raspberry Pi to the desktop and take a picture (with a regular