SY SEMESTER-III

Course Code: BIC26PCL201	**Course Name:** Sensors and Transducers	**Course Category:** PCC
Credits: 2	**Teaching scheme:** L-2	**Evaluation scheme:** CA–60, ESE–40
Duration: 2 h		
Pre-requisites: Basic of electronics and electrical		

Course Objectives:

1.To understand fundamental concepts of sensors and Transducers

2.To learn the different Measurements

3.To understand various environmental sensors

Course Outcomes:

CO1**:** To understand various sensors used in temperature measurement

CO2: To explain working principle various pressure sensors

CO3: Explain design criteria of flow measurement

CO4: Apply various sensors knowledge

Contents:

Unit	Content	Teaching Hours
1	**Temperature Measurement:** Introduction to sensors and its characteristics**,** selection criteria, standards and calibration, data acquisition, Importance of sensing and its use in data analytics, Temperature scales, classification of temperature sensors, standards, working principle, types, materials, Non electrical sensors (thermometer, thermostat), electrical sensors (RTD thermocouple, Thermistor, radiation sensors (pyrometers Lies t various standards used for selection of transducers/sensors).	8
2	**Pressure and Level Measurement:** Definition pressure scale, standards, working principle, types, materials, elastic pressure sensors, secondary pressure sensors, differential pressure sensors, capacitive (delta cell), high-pressure sensors, low-pressure sensors, standards, working principle, types, materials, design criteria: float, displacers, bubbler, ultrasonic, microwave, radar, resistance, thermal, solid level detectors	8
3	**Flow Measurement:** Standards, working principle, types, materials, and design criterion: primary or quantity meters (positive displacement flow meter), secondary or rate meter (obstruction type, variable area type), electrical flow sensors (turbine type, electromagnetic type, and ultrasonic type), flow switches	7
4	**Environmental sensors:** pH sensors, Conductivity sensors, Humidity, turbidity, dissolved oxygen (DO) sensor, Biochemical oxygen demand (BOD) sensor, total dissolved oxygen (DO) sensor, Chemical Oxygen Demand (COD) sensor: working principles, types and applications	7

	flame sensor, smoke sensor, motion sensor, leak detector, density, Viscosity: working principles, types and applications. Smart sensors, MEMS, Nano sensors, semiconductor sensors, biosensors: Introduction and applications	

Text Books:
1. D.V.S. Murthi, "Instrumentation and Measurement Principles", PHI, New Delhi, Second ed. 2003
2. D. Patranabis, "Principle of Industrial Instrumentation", Tata McGraw Hill, Second ed., 1999
3. R.S, Khandpur, "Handbook of Analytical Instruments", Tata McGraw Hill Education, third edition., 2017
4. R. Frank, "Understanding SmartSensors",Artechhouse,secondedition,2000.
Reference Books:
1. B.G. Liptak, "Process Measurement & Analysis", Chilton Book Company, Fourthed., 2003.
2. E.O. Doebelin, "Measurement Systems", McGraw Hill, Fifthed., 2003.
3. SabrieSoloman,"SensorsHandbook",McGrawHillPublication,Firsted.,1998.
4. A. K. Sawhney, "Electrical & Electronic Instruments & Measurement", Dhanpat Rai and Sons, Eleventh ed., 2000.
5. R.K.Jain,"EngineeringMetrology",KhannaPublisher,Delhi,Eighteenthed.,2002.
PaulChapman,"SmartSensors"ISAseries,199
E-Resources:
1. www.nptel.ac.in (Learning platform from IIT profe**ssors)**
2. **nptel.ac.in/courses/103101142**
3. www.discoveryforengineers.com (Investigating Discoveries)

Course Code: BIC26PCL202 **Course Name:** Control System **Course Category:** PCC
Credits: 2 **Teaching scheme:** L-2 **Evaluation scheme:** CA–60, ESE–40
Duration: 2h
Pre-requisites : Fundamentals of accounting and finance

Objectives :

1. To study electrical and mechanical system
2. To study system response

Course Outcomes:

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

CO1. Develop mathematical model of Electrical and Mechanical system using differential equations and transfer function and develop analogy between Electrical and Mechanical systems.

CO2. Determine time response of systems for a given input and perform analysis of first and second order systems using time domain specifications.

CO3. Investigate closed loop stability of system in s-plane using Routh Hurwitz stability criteria and root locus.

CO4. Analyze the systems in frequency domain and investigate stability using Nyquist plot and Bode plot

Contents:

Unit	Content	Teaching Hours
1	**Basics of Control System**: Basic concepts of control system, classification of control systems, types of control system: feedback, tracking, regulator system, feed forward system, transfer function, concept of pole and zero, modeling of Electrical and Mechanical systems (Only series linear and rotary motion) using differential equations and transfer function ,analogy between electrical and mechanical systems, block diagram algebra, signal flow graph, Mason's gain formula	8
2	**Time domain analysis:** Concept of transient and steady state response, standard test signals: step, ramp, parabolic and impulse signal, type and order of control system, time response of first and second order systems to unit impulse, unit step input, time domain specifications of second order systems, derivation of time domain specifications for second- order under-damped system for unit step input, steady state error and static error coefficients	8
3	**Stability analysis and Root Locus:** Concept of stability: BIBO, nature of system response for various locations of poles in S-plane, Routh's- Hurwithz criterion. Root Locus: Angle and magnitude condition, Basic properties of root locus. Construction of root locus, Stability analysis using root locus.	7
4	**Frequency domain analysis**: Introduction to Frequency domain specifications, correlation between time and frequency domain specifications, polar Plot, Nyquist plot, stability analysis using Nyquist plot. Introduction to Bode plot, Asymptotic approximation: sketching of Bode plot, stability analysis using Bode plot	7

Text Books:
1. I. J. Nagrath, M. Gopal, “Control System Engineering”, New Age International Publishers, 6th edition, 2017.
2. R.AnandanatrajanandP.RameshBabu,“ControlSystemsEngineering”,Scitech Publication,3rdedition, 2011
3. D. Roy Choudhary, "Modern Control Engineering", PHI Learning Pvt.Ltd.,2005.
4. Katsuhiko Ogata, “Modern control system engineering”, Prentice Hall, 2010.
Reference Books:
1. B. C. Kuo, “Automatic Control System”, Wiley India, 8th Edition,2003.
2. Vande Vegte, John. Feedback Control Systems.3rded. Prentice Hall,1994.
3. Nise N.S. “Control Systems Engineering”, John Wiley & Sons,Incorporated,2011
4. Richard C Dorf and Robert H Bishop, “Modern control system”, Pearson Education, 12th edition, 2011.
5. Ogata, Katsuhiko. Solving Control Engineering Problems with MATLAB. Prentice Hall, 1993.
E-Resources:
1. www.nptel.ac.in (Learning platform from IIT profe**ssors)**
2. www.discoveryforengineers.com (Investigating Discoveries)
3. nptel.ac.in/courses/107106081

Course Code: BIC26PCL203 **Course Name:** Electrical Machines **Course Category:** PCC
Credits: 3 **Teaching scheme:** L-3 **Evaluation scheme:** CA–60, ESE–40
Duration: 2 h
Pre-requisites: Basic of Electrical and fundamentals of machines

Course Objectives:

1.To understand fundamental concepts in Python Programming
2.To learn the different Conditional Loops and Iteration
3.To understand various data structures and packages

Course Outcomes:

CO1: Analyze constructional aspects and operational aspects of electric machines
CO2: Evaluate performance parameters of electric machines.
CO3: Adopt suitable control methods for operating electric machines
CO4: Select appropriate electric machines based on constructional & operational characteristics

Contents:

Unit	Content	Teaching Hours
1	**DC Motors** Construction & operating principle, types of DC motors, PMDC motors, back-emf and its importance, torque production, characteristics, various losses and performance estimation ,speed control and applications	12
2	**Transformers** Construction & operating principle-single phase and three phase, types of transformer, turn- ratio, equivalent circuit, various losses & performance estimation, parallel operation, applications **Permanent Magnet Brushless DC(PMBLDC)Motors:** torque and Construction and operating principle emf equations, torque/speed characteristic: performance and efficiency, controllers for PMBLDC motors, applications	12
3	**Induction Motors** Construction & operating principle of three phase machines, types of induction motors, torque production, torque-slip characteristic, equivalent circuit representation, various losses & performance estimation, speed control, single phase ac motors, universal motors and applications	11
4	**Special Purpose Motors** Basics of stepper motor, construction, working and characteristics of variable reluctance(VR) stepper motors, micro stepping control of stepper motor, construction and working of multi stack VR stepper motor, construction and working of permanent magnet (PM)stepper motor, construction and working of hybrid stepper motor, servo motor types, construction and operation of servo motors, servo motor controllers, applications	10

Text Books:
1. A.E. Fitzerald, Charles Kings ley and Stephen D Umans, Electric Machinery, TMH Publication.
2. B.L. Theraja, A.K. Theraja, A Textbook of Electrical Technology Volume-II, S. Chand &Co.
Reference Books:
1. P.S. Bhimbra, Electrical Machinery, Dhanpatrai Publishers.
2. Miller T. J. E., Brushless Permanent Magnet and Reluctance Motor Drives, Clarendon Press.
3. V.V. Athani, Stepper Motors: Fundamentals, Applications and Design, New Age International Pvt. Ltd.
4. P.C. Sen, Principles of Power Electronics, John Wiley and Sons.
E-Resources:
Name of the website/ E-Journals/ Online Videos
1. nptel.ac.in/courses/108102146

Course Code: BIC26PCP201 **Course Name:** Sensors and Transducers lab **Course Category:** PCC

Credits: 1 **Teaching scheme:** P-2 **Evaluation scheme:** CA–30, ESE–20

Pre-requisites: Student should know the basic aspects of measurements like least count and range of instrument, scale identification, accuracy, error etc.

Course Objectives:

The Objective of this course are

1. To make the students gain practical knowledge to co-relate with the theoretical studies.
2. To achieve perfectness in experimental skills.
3. The study of practical applications will bring more confidence.

Course Outcomes:

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

CO1: To Introduce different types of transducers.

CO2: Perform optical experiments; using light properties like interference, polarization, diffraction and their applications.

CO3: Interpret the results and analyze the data and use the experimental data to plot the graph for a best fit.

CO4: Discuss the characteristics of plateau region and determine operating voltage of G.M. counter

CO5: Determine the numerical aperture and bending loss of optical fibre cable

Contents:

Sr. No.	List of Practical	Lab Hours
1	To study the characteristics of LVDT	02
2	To study the characteristics of Variable Capacitor.	02
3	To study the characteristics of Light Dependent Resistor	02
4	To study the humidity sensor	02
5	To study the characteristics of Crompton Potentiometer.	02
6	To study the characteristics of Thermocouple.	02
7	To study the characteristics of Resistance Temperature Detector	02
8	To study the characteristics of Thermistor.	02
9	To study pressure sensors	02
10	To study flow measurement	02

Course Code BIC26PCP202	**Course Name:** Control System lab	**Course Category:** PCC
Credits: 1	**Teaching scheme:** P-2	**Evaluation scheme:** CA–30, ESE–20

Pre-requisites:

Student should know the basic aspects of measurements like least count and range of instrument, scale identification, accuracy, error etc.

Course Objectives:

The Objective of this course are

1. To Study time response of system
2. To achieve perfectness in experimental skills.
3. The study of practical applications will bring more confidence.

Course Outcomes:

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

CO1: To Introduce different types of transducers.

CO2: To introduce temperature sensor

CO3: Use Matlab software to learn control systems.

CO4: Examine the response of control system by measuring relevant parameters under different disturbances

Contents:

Sr. No.	List of Practical	Lab Hours
1	Time response of system	02
2	Study of transfer function	02
3	To plot poles and zeros locations of a first order and second order transfer functions. Also simulate them to different inputs using Matlab	02
4	To find the closed loop transfer function of multi-loop feedback block diagram via block diagram reduction method using Matlab..	02
5	To plot Root Locus using Matlab.	02
6	To plot Root Locus and identify stability of a system using Matlab.	02
7	To plot Nyquist plot and identify stability of a system using Matlab	02
8	To plot Bode plot and identify stability of a system using Matlab	02
9	To study DC potentiometer as error detector.	02

Course Code BIC26PCP203 **Course Name:** Electrical Machines lab **Course Category:** PCC

Credits: 1 **Teaching scheme:** P-2 **Evaluation scheme:** CA–30, ESE–20

Pre-requisites: Electrical machines fundamentals.

Course Objectives:

The Objective of this course are

1. To Study time response of system
2. To achieve perfectness in experimental skills.
3. The study of practical applications will bring more confidence.

Course Outcomes:

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

CO1: To Introduce DC MOTOR.

CO2: To introduce Transformer

CO3: Use Introduce Stepper motor

Contents:

Sr. No.	List of Practical	Lab Hours
1	Study of DC MOTOR	02
2	Study of speed control of DC Motor	02
3	Study of Transformer	02
4	Study of Induction Motor	02
5	Study of Stepper Motor	02
6	Study of permanent magnet stepper Motor	02
7	Study of Servo Motor	02
8	Application of motors	02

Course code: BRO21HSL205 **Course name:** Business Management and Financial Accounting **Course category:** EEMC

Credits: 2 **Teaching scheme:** L-2 **Evaluation scheme:** CA–60 ESE–40 Duration: 2h

Pre-requisites: Basic Management

Course Objectives:

1. To help the students to analyze the risk and return of alternative sources of financing.
2. To enable students to describe the estimated cash flows from a project, including operating, net working capital, and capital spending.
3. To provide the students to understand the related information of business Finance. Students can prepare basic financial statements.
4. To enable students to prepare final financial statements.

Course Outcomes:

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

CO1: Analyze the risk and return of alternative sources of financing.

CO2: Estimate cash flows from a project, including operating, net working capital, and capital spending.

CO3: Define basic terminology used in finance and accounts.

CO4: Prepare Financial Statements.

Contents –

Unit	Content	Teaching hours
1	**INTRODUCTION TO BUSINESS MANAGEMENT:** Aims, Objective And Function of Business Management, Principles of Management, Concept of business finance, Goals & objectives of financial management, Sources of financing-Long Term financing and Short Term Financing	07
2	**BUSINESS CAPITAL MANAGEMENT:** Concept of business working Capital, significance, types. Adequacy of working capital, Factors affecting working capital needs, financing approaches for working capital, Methods of forecasting, working capital requirements	08
3	**BASICS OF FINANCIAL ACCOUNTING:** Meaning, Scope and importance of Financial Accounting. Financial Accounting - concepts and conventions, classification of accounts, Rules and principles governing Double Entry Book-keeping system, Meaning, Preparation of Journal, Ledger, Cash book & Trial balance.	07
4	**FINANCIAL STATEMENT PREPARATION AND ANALYSIS:** Preparation of financial statements. Profit & Loss Account, Balance Sheet, Ratio Analysis.	08

Text Books:

1. Financial Management by Khan & Jain, Text, Problem & Cases, Tata McGraw Hill Publication 5th Edition.
2. Tulsian Financial Management by Dr. P. C. Tulsian, S Chand Publication 5th Edition.
3. Taxman's Financial Management by Ravi M. Kishore, Taxmann 2017 Edition

Reference Books:

1. A Textbook of Financial, Cost & Management Accounting by Dr. P. Periasamy, Himalaya Pub.
2. Fundamentals of Financial Management by Bhabhtosh Banerjee, PHI publication, 2nd Edition.

Course Code: MGM56VEL102 **Course Name:** Constitution of India **Course Category:** VEC

Credits: 2 **Teaching scheme:** L-2 **Evaluation scheme:** CA–30, ESE–20

Duration: 1h

Pre-requisites: basics of Indian Constitution

Objectives :

1. To make students understand the Constitution and its importance
2. To sensitize the students about Fundamental Rights and duties enshrined under Indian
3. To familiarize students with the working of Indian Constitution

Course Outcomes:

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

CO1: Understand and explain the significance of Indian Constitution as the fundamental law of the land

CO 2: Will be able to exercise his fundamental rights in proper sense at the same time identifies his responsibilities in national building

CO 3: To analyze the Indian political system, the powers and functions of the Union, State and Local Governments in detail

CO 4: To Understand Electoral Process, Emergency provisions and Amendment procedure

Contents:

Unit	Content	Teaching Hours
1	**History :** Teaching Historical Background and Philosophy of Indian Constitution: Societies before and after the Constitution adoption. Introduction to the Indian constitution. Making of the Constitution. Role of the Constituent Assembly. Preamble and Nature of Indian Constitution Salient features of Indian Constitution	8
2	**Fundamental Rights & Duties :** Right to equality , Right to freedom Right against exploitation , Right to freedom of religion ,Cultural and educational rights ,Right to Constitutional remedies, Fundamental Duties Directive principles of state policy: Meaning and significance of Directive Principles ,Economic Principles , Political Principles	8
3	**4 Organs of Government:** Centre and State Legislature, Centre and State Executive Centre and State Judiciary ,Local Self Government	7
4	**Other Important Constitutional Provisions:** Emergency Provisions under Indian Constitution, Election Commission.	7

Text Books:
1. D. D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2013.
2. Subhash Kashyap, Our Constitution (An Introduction of Indian constitution and Constitutional Law), National Book Trust, India, 2001
3. M. P. Jain, Outline of Indian Legal and Constitutional History, Lexis Nexis, 2014 Constitutional Law of India- J. N. Pandey-
Reference Books:
1. G. Austin, The Constitution of India, Cornerstone of a Nation. Oxford University press 1966.
2. M.V. Pylee- Constitutional Government in India, Bombay Asia publishing House 1975.
3. Chandra, Bipan and Others, India Since Independence, Penguin Books, New Delhi, 20015
4. H.M. Seervai Constitution of India.
5. Narendra Chapalgaonker, Mahatma Gandhi and the Indian Constitution, Routledge (Manohar) Publication,
E-Resources:
1. www.nptel.ac.in (Learning platform from IIT profe**ssors)**
2. www.discoveryforengineers.com (Investigating Discoveries)
3. nptel.ac.in/courses/129106411

Course code: BIC26FPJ205	**Course name:** Field Project	**Category:** FP
Credit: 2	**Teaching scheme:** P-4	**Evaluation scheme:** CA–30, ESE–20
Pre-requisites: None		

Course Objectives:

1. To acquaint with the process of identifying the needs and converting it into the problem.
2. To familiarize the process of solving the problem in a group.
3. To acquaint with the process of applying basic engineering fundamentals to attempt solutions to problems.
4. To inculcate the process of self-learning and research.

Course Outcomes:

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

CO1: Identify problems based on societal /research needs.

CO2: Apply Knowledge and skill to solve societal problems in a group.

CO3: Develop interpersonal skills to work as member of a group or leader.

CO4: Draw the proper inferences from available results through theoretical/ experimental/simulations.

CO5: Analyze the impact of solutions in societal and environmental context for sustainable development.

Contents –

GUIDELINES FOR FIELD PROJECT:

The students may be grouped into 2 to 4 and work under a project supervisor.

The device/case study/ system/component(s) to be design and develop shall be decided in consultation with the faculty supervisor and if possible with an industry/society. A field project report to be submitted by the group and the solution to system/case study/model/fabricated model, which will be reviewed and Evaluated for internal assessment by a Committee constituted by the Head of the Department. At the end of the semester examination of the field project work is evaluated based on oral presentation and the project report jointly by external and internal examiners

Constituted by the Head of the Department.

i. Students shall form a group of 2 to 4 students.

ii. Students should do survey and identify needs, which shall be converted into problem statement for project in consultation with faculty supervisor.

iii. Student shall submit implementation plan in the form of Gantt/PERT/CPM chart, which will cover weekly activity of project. A log book to be prepared by each group, wherein group can record weekly work progress, guide/supervisor can verify and record notes/comments.

iv. Faculty supervisor may give inputs to students during project activity; however, focus shall be on self-learning.

v. Students in a group shall understand problem effectively, propose multiple solution and select best possible solution in consultation with guide/ supervisor.

vi. Students shall convert the best solution into working model using various components of their domain areas and demonstrate.

vii. The solution to be validated with proper justification and report to be compiled in standard format with the focus on the self-learning, innovation, addressing societal problems and entrepreneurship quality development within the students through the Projects.

CONTINUOUS ASSESSMENT:

The review/ progress monitoring committee shall be constituted by head of departments.

The progress of field project to be evaluated on continuous basis, minimum two reviews in the semester shall be conducted. In continuous assessment focus shall also be on each individual student, assessment based on individual's contribution in group activity, their understanding and response to questions.

MARKS DISTRIBUTION OF CONTINUOUS ASSESSMENT AND

END SEMESTER EXAM ARE AS BELOW:

Marks awarded based on Log Book: 15

Marks awarded based on Quality of Project Report: 15

Marks awarded by review committee (ESE): 20

FIELD PROJECT SHALL BE ASSESSED BASED ON FOLLOWING POINTS :

- Quality of problem and Clarity
- Innovativeness in solutions
- Cost effectiveness and societal impact
- Full functioning of working model as per stated requirements
- Effective use of skill sets
- Effective use of standard engineering norms
- Contribution of an individual's as member or leader
- Clarity in written and oral communication