MKSSS's Cummins College of Engineering for Women, Pune
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)

Level 4.5 | First Year
Curriculum for UG Degree Course in BTech. E&TC/ Instru / Mech Programmes

(Academic Year: 2023-24 Onwards)

Semester-II

Course Code	Course Title	Teaching Scheme Hours / Week			Cr	Examination Scheme			Total Marks
		L	T	P		ISE	ESE	Pr/Or	
BSC102	Chemistry	3	0	0	**3**	50	50	0	100
BSC201	Multivariate Calculus	3	1	0	**4**	50	50	0	100
ESC102	Basics of Electrical & Electronics Engineering	3	0	0	**3**	50	50	0	100
ESC203	Sustainable Engineering	3	1	0	**4**	50	50	0	100
CC202	Liberal Learning Course-2	1	0	2	**2**	50	0	0	50
*PCCxx201	Programming Core Course-1	2	0	0	**2**	25	25	0	50
BSC102L	Chemistry Lab	0	0	2	**1**	25	0	0	25
ESC102L	Basics of Electrical & Electronics Engineering Lab	0	0	2	**1**	25	0	0	25
VSEC201L	Programming Skills in Python Language	0	0	4	**2**	25	0	25	50
	Total =	**15**	**02**	**10**	**22**	**350**	**225**	**25**	**600**

L=Lecture, T=Tutorial, P= Practical, Cr= Credits, ISE =In Semester Evaluation, ESE =End Semester Examination, Pr/Or = Practical/Oral.

**PCCEC201:Principles of Communication Systems ; *PCCME201: Engineering Mechanics*

**PCCIN201: Principles of Measurement and Automation System*

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BSC102 Chemistry

Teaching Scheme
Lectures: 3Hrs/week
Credits: 3

Examination Scheme
In-Semester: 50Marks
End-Semester: 50Marks

Course Objectives

The Chemistry course is designed such that the learners imbibe chemical principles relevant in the engineering context. The course facilitates undergraduates to understand chemical processes, methods of analysis, structure-property relationship and evaluate the role of chemical substances for engineering applications. Further the course inculcates basic problem-solving skills involving chemistry principles.

Course Outcomes:

After completion of this course a student should be able to

CO1: Interpret properties and applications of molecules based on their atomic structure.
CO2: Analyze quality parameters for water, coal, petrol using analytical methods.
CO3: Apply chemical principles for problems related to water, batteries, fuel or polymers.
CO4: Outline the process of synthesis for inorganic substances and nanomaterials.
CO5: Elucidate the construction and functioning of a device/chemical reagent.

Module 1: Physical Chemistry

Unit 1. Chemical Bonding: Types of bonds, intermolecular forces, bonding in molecules: valence bond theory, molecular orbital theory for diatomic molecules.

Unit 2. Electrochemistry: Electrochemical cell, Nernst equation, EMF of cell, reference and indicator electrodes, battery characteristics, Lead-acid, Lithium-ion battery, Fuel cell technology.

Module 2: Inorganic and Materials Chemistry

Unit 3. General overview of the Periodic table and properties; chemistry of some elements like H, Si and their compounds, Si for chipmaking, H_2 gas as fuel.

Unit 4. (A) Engineering materials: Structural features, properties and applications of OLEDs - PPV (- solar cell), liquid crystal polymers, conducting polymers – as a chemical sensor, polymer composites.

(B) Nanomaterials:
Introduction to nanomaterials, synthesis by top down and bottom-up methods.
Structure, synthesis and some typical applications of nanomaterials.

Module 3: Analytical Chemistry

Unit 5. Analysis of -
(A) Water: Hardness determination in water, TDS, effect of hard water in boilers,

Internal and external treatment of hardness, water softening techniques -zeolite and ion exchange method. Desalination methods-Reverse osmosis. Electrodialysis. Wastewater recycling.
(B) Carbon based fuels: Analysis of coal/petrol.

Unit 6. Analytical techniques such as spectroscopy, pH-metry, conductometry and their applications.

Text Books:

1. S.S. Dara 'Engineering Chemistry' S. Chand Publications (2010)
2. B.S. Chauhan 'Engineering Chemistry': Univ Sc Press. (Third edition)2009
3. Shashi Chawla 'A Text Book of Engineering Chemistry': Dhanpat Rai & Co. (2015)
4. Jain and Jain 'A Text Book of Engineering Chemistry' Dhanpat Rai & Co.
5. G. Chatwal 'Instrumental methods of Chemical Analysis' Himalaya publication house

Reference Books:

1. Steven S. Zumdahl, 'Chemistry concepts and applications', Cengage learningpublication (2009)
2. Ram D. Gupta, 'Hydrogen fuel 'C.R.C. Publications (2009)
3. Puri, Sharma, Pathania 'Principles of Physical Chemistry': Vishal Publ. Co.
4. Robert Braun' Instrumental methods of analysis' Pharma med press (2010)
5. J.D. Lee, 'Concise Inorganic Chemistry', 4th edition, Wiley Publication (2019)

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BSC201 Multivariate Calculus

Teaching Scheme:
Lectures: 3 Hrs/Week
Tutorial: 1 Hr/Week
Credits: 4

Examination Scheme:
In-Semester: **50** Marks
End-Semester: **50** Marks

Course Objectives:

1. To familiarize the students with techniques of differentiation and integration of multivariable function.
2. To equip the students to deal with advanced level of Mathematics, and applications that would be essential for their disciplines**.**

Course Outcomes:

After completion of this course, students will be able to

CO1: Calculate partial derivatives and solve problems using partial derivatives.

CO2: Analyze stationary points and calculate extrema of function of several variables.

CO3: Solve double integral, triple integral over the region.

CO4: Determine physical parameters using double and triple integral.

Course Content:

Unit – I: Partial differentiation

Function of several variables, partial derivatives, Geometrical interpretation of partial derivatives, chain rule, higher order partial derivatives, Euler's theorem.

Unit – II: Applications of partial differentiation.

Maxima, minima and saddle points, second derivative test, constrained extrema and Lagrange's multipliers, applications in optimization of functions of several variables. Applications of first order partial derivatives in data fitting using the method of least squares.

Unit – III: Double integration

Tracing of curves in Cartesian and Polar coordinate system, double integrals over a rectangle, double integrals over regions, change of order of integration, Introduction of Jacobian determinant for two variables, double integral in polar coordinates, The Gaussian integral.

Unit – IV: Triple integration

Triple integral over a box, triple integrals by iterated integration, change of variables, Cylindrical and Spherical coordinates, The Jacobian determinant for three variables, evaluation of triple integral.

Unit – V: Applications of Double and Triple integration

Applications of double integral and triple integral: Area of plane Lamina, mass of plane lamina, surface area, volume, mass of solid.

Text Books:

1. B. V. Ramana, **'Higher Engineering Mathematics',** *Tata McGraw Hill Publications,* (2007).

2. B.S. Grewal, '**Higher engineering Mathematics**', *Khanna publishers, (*40th edition), (2008).

3. Hughes-Hallett et al., '**Calculus - Single and Multivariable',** *John-Wiley and Sons,* (3rd Edition), (2003).

4. Maurice Weir, Joel Hass, '**Thomas' Calculus'**, *Pearson India*, (13th edition), (2016).

Reference Books:

1. J. E. Marsden, A. J. Tromba and A. Weinstein, '**Basic Multivariable Calculus'**, *Springer*, (3rd edition), (1993).

2. G. B. Thomas and R. L. Finney, '**Calculus and Analytic geometry'**, *Pearson, Reprint* (9th Edition), (2002).

3. Sudhir Ghorpade, Balmohan Limaye, '**A Course in Multivariable Calculus and Analysis'**, (Undergraduate Text in Mathematics), *Springer* (2009).

4. Dennis G. Zill, Warren S. Wright**, 'Multivariable Calculus**, **Early Transcendental'**, *Jones & Bartlett Publisher*(4th edition), (2009).

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ESC102 Basic Electrical and Electronics Engineering

Teaching Scheme:
Lectures: 3 Hrs./Week
Credits: 3

Examination Scheme
In-Semester: **50** Marks
End-Semester: **50** Marks

Course Objectives:
1. To educate the students about the realization of basic theoretical concepts & laws in electrical engineering in real physical world.
2. To make students familiar with three phase supply.
3. To make students familiar with single phase transformers.
4. To understand the construction and applications of diode and BJT
5. To understand basics of combinational logic, Boolean algebra and flip -flops.

Course Outcomes:
After completion of course, students will be able to
CO1: Analyze and calculate parameters of DC circuits.
CO2: Analyze and calculate parameters of AC circuits.
CO3: Calculate performance parameters of single-phase transformer.
CO4: Analyze I-V characteristics of semiconductor diodes and transistors and design simpleanalog circuits using these devices.
CO5: Build simple combinational and sequential logic circuits.

Unit – I: DC Networks
Kirchhoff's laws, Mesh and Nodal Analysis, Thevenin and Superposition Theorems, maximum power transfer theorem, Network Simplifications using star-delta / delta-startransformations.

Unit – II: AC Circuits
Series and parallel RL, RC and RLC circuits, concept of Impedance and admittance, power triangle and power factor. Resonance in series and parallel RLC circuit, Three phase voltage generation and waveform, star and delta balanced systems. Relationship between phase and line quantities, phasor diagram, power in a three phase circuit.

Unit – II: AC Circuits

Series and parallel RL, RC and RLC circuits, concept of Impedance and admittance, power triangle and power factor. Resonance in series and parallel RLC circuit, Three phase voltage generation and waveform, star and delta balanced systems. Relationship between phase and line quantities, phasor diagram, power in a three phase circuit.

Unit – III: Electromagnetism and Single Phase Transformers

Magnetic materials and B-H curve, self and mutual inductance,1 Φ transformer: concept,

types, working, ideal transformer, practical transformer, equivalent circuit, phasor diagram,efficiency and regulation calculations.

Unit – IV: Diodes and rectifiers

Construction and characteristic of p-n junction diode, LED, photodiode, Half wave, full wave and bridge rectifiers, need of capacitor filter, rectifier operation with capacitor filter, Zener diode as a voltage regulator, block diagram of Regulated power supply

Unit – V: Junction Transistor Amplifiers

Bipolar junction transistor, Construction of BJT, Types of biasing:-fixed bias and self bias circuit, BJT characteristics for-CE,CB,CC configurations, relationship between α and β, loadline for a transistor, application of transistor as a switch and amplifier.

Unit – VI: Digital Electronics

Basic gates, implementation of basic gates using universal gates, Boolean algebra, standard representation of logic functions (SOP and POS forms), Introduction of Combinational logic circuits like multiplexer, demultiplexer, half adder and full adder, Introduction of Sequential logic circuits like flip- flops (SR, D), counters and shift registers.

Text Books:

1. Hughes, 'Electrical and Electronic Technology', Pearson education, (10th edition), (2008)

Reference Books:

1. D.P. Kothari and I.J. Nagrath, 'Basic Electrical Engineering', McGraw-Hill, (3rd edition), (2010)
2. A.E.Fitzgerald, A.Grabiel,'Basic Electrical engineering',McGraw-Hill, (5th edition), (2009)
3. Floyd, 'Electronic Devices and Circuits', pearson education, (7th edition),(2008)
4. AP Malvino & Donald Leach,'Digital Principles and Applications', McGraw Hill Education,(6 th edition), (2009)

ESC203 SUSTAINABLE ENGINEERING

Teaching Scheme
Lecture: 3 Hrs/week
Tutorial: 1Hr/week
Credits: 4

Examination Scheme
In semester: 50 marks
End Semester: 50 Marks

Course Objectives:

1. To understand interdisciplinary approach towards sustainable development.
2. To acquire knowledge, skills, values & attitudes that empowers to contribute to sustainable development.
3. Understand the relevance and importance of natural resources & protection of environment for sustainability.
4. To understand the role of engineering & technology within sustainable development.

Course Outcome:

After completion of this course a student should be able to

CO1: Identify the need for sustainable development.

CO2: Explain the challenges in achieving environmental sustainability.

CO3: Compare & suggest suitable method of water harvesting.

CO4: Calculate energy efficiency of building.

CO5: Distinguish between smart cities with other cities.

Unit I: Introduction to Sustainable Engineering

Need & concept of sustainability, Three circle model- Social, environmental & economic, Role of sustainable engineering, Goals and Challenges of sustainable development

Unit II: Environmental Sustainability

Environmental issues- resource degradation, climate change, global warming, ozone layer depletion, Sources, effect, collection & disposal of solid waste, Concept of LCA & Circular economy (3 R concept), zero waste concept, carbon credits & carbon foot print, Assessment tools for sustainability, Disaster Management.

Unit III: Sustainable Use of Water Resources

Need of water conservation, Traditional & modern methods of Rainwater harvesting, sustainable use of water, source, effect & treatment of waste water, Household/ Domestic Solutions, Agricultural Solutions.

Unit IV: Sustainable Use of Energy Resources

Energy resources -Basic concepts- Conventional & non-conventional, Solar energy, wind energy, biofuels, energy derived from oceans, geothermal energy, Sustainable Approach to Energy Management, low-carbon energy systems, hydrogen fuels, carbon-neutral fuels, Energy storage, Waste to energy technology, Methods for increasing energy efficiency of building.

Unit V: Sustainable Urbanization

Basic concepts of sustainable habitats, Integrated build environment, Concept of Urban forestry, Concept of New urbanism, Concept features & strategies of Smart city, Green building, Concept of smart village, case studies.

Text Books:

R.L.Rag, Lekshmi Dinachandran Ramesh - Introduction to Sustainable engineering

Reference Books:

1. Bhavik R. Bakshi - Sustainable engineering (principles and practise) -*Ohio state university*
2. Allen D.T and shonnard D. R- Sustainability engineering concept design and case studies.
3. Mokia schoiz- Sustainable Water treatment engineering solution for variable climate
4. *Handbook of Sustainable Engineering* W. Wimmer, and Joanne Kauffman (Eds.), Springer (Available in June 2011).

CC202 Liberal Learning Course-2

Teaching Scheme
Lecture: 1 Hr/week
Lab: 2 Hrs/week
Credits: 2

Examination Scheme
In-Semester: 50 marks

- Student will opt for any **one** of the following 3 options.
- Brief description/syllabus of the modules proposed under this course are as follows:

A: Foreign Language (German/French/Japanese)
Basics of language: Reading, Writing and Listening, Vocabulary, Greetings words
Grammatical rules, Verb categorization, Dialogue oriented vocabulary with little grammar

B: Personality Development and Leadership
Personality, Self-Assessment, Individual personality attributes and characteristics, Factors determining work performance.
Leadership traits, Leadership Development

C: Yogasana& Meditation
Preparatory Movements/ Loosening Exercise, Surya namaskar, Science of Yoga and Breathing Techniques
Pranayama and Meditation

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CC202 Liberal Learning Course-2
A: Foreign Language (German/French/Japanese)

Teaching Scheme
Lectures: 1 Hour / Week
Lab: 2 Hours/ Week
Credits: 2

Examination Scheme
In-Semester: 50 Marks

Course Objectives:

1. Enable engineering students for primary communication in foreign language and to understand intonation of language while indulging in day to-day dialogues
2. Acquaintance with skills of reading, writing, and listening thereby helping for better communication.

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

CO1 Read and Write Basics of Foreign Language

CO2 Demonstrate listening skills and memorising vocabulary and to apply the same when communicating with proper grammar.

CO3 Express their thoughts and confidently speak about day to-day dialogues.

Unit I: Basics of language writing and reading

Alphabets, Numbers, Vocabulary, Months, Seasons, Weekdays, Fruits, Colors, Vegetables, Greetings words, Me- Myself, Family Introduction, Time Expression, Food and Beverages etc

.

Unit II: Reading, Writing and Listening

Grammatical rules and their application in communication skills. Nouns, Pronouns, Articles, Cases, Verbs and their declination, Verb categorization, Usages of verbs in present tense, W questions etc. Focus on the Listening skills with the help of audio tracks in foreign languages, Introducing dialogue-oriented vocabulary with little grammar. Describe your House, Food and Clothing, Shopping, Professions, Festivals, Hobbies etc.

Reference Books:

1. Sprachlotsen 1 German course book for Maharashtra State Board
2. Deutsch Kreative International- German Composite Course for 10th standard.
3. Easy Japanese - NHK
4. Apprenons le francais – Mahita Ranjit – French

CC202 Liberal Learning Course-2

B: Personality Development and Leadership

Teaching Scheme

Lectures: 1 Hour / Week
Lab: 2 Hours/ Week
Credits: 2

Examination Scheme

In-Semester: 50 Marks

Course Objectives:

1. Understand various aspects of personality and its traits
2. Study different techniques for personality development and leadership
3. Understand leadership skills, styles, and its traits

Course Outcomes:

After completion of the course, students will be able to

CO1: Demonstrate the Self-awareness in aspects of goals, values, emotions and self-image

CO2: Apply techniques for Self-management and Personality Development

CO3: Illustrate the leadership skills, traits for Leadership Development

Unit I: Self-management & Integrated Personality Development

Personality: Definition, Personality Traits, **Self-knowledge**: Exploring habits, Preferences and experience, Knowing ambitions, goals and Core values, **Self-Assessment**: SWOT analysis, Personality quotients (Intelligence Quotient- IQ, Emotional Quotient- EQ, Social Quotient- SQ) Interpersonal Relationship, Time management, Ethics, Integrity, Values, Attitude, Responsibility, ways to develop positive attitude.

Integrated Personality Development: Gradual growth in different dimensions of personality: Physical, Intellectual, Emotional, Moral, Social and Spiritual, enhancing self-image and self-confidence, **Factors determining work performance:** Self-esteem, Goal setting

CC202 Liberal Learning Course-2

B: Personality Development and Leadership

Unit II: **Leadership:** Communication Skills, interpersonal Skills, Team Building, Mental Strength, Self-confidence, Self-assurance, Empathy and listening skills, Stress Management & Time Management

Leadership Development: Decision-making skills, Conflict: Process & Resolution, Developing effective Habits, Effective Speech, Good manners & Etiquettes Emotional Intelligence

Leadership styles: Autocratic Leadership, Pace-setting Leadership, Transformational Leadership, Coaching Leadership, Democratic Leadership, Affiliative Leadership, Delegative Leadership

Textbooks:

1. Mark J., "Personality Development", Zen Consultants 2002
2. Joshi V. "Leadership and Personality Development", Symbiosis Centre of Distance Learning 2011

Reference Books:

1 Mitra B.K., "Personality Development and Soft Skills", Oxford 2013
2 Dale Carnegie, "The Leader in You", Prabhat Prakashan, Delhi, 2018

Online Resources:

1. www.ted.com

CC202 Liberal Learning Course-2

C: Yogasana & Meditation

Teaching Scheme
Lectures: 1 Hour / Week
Lab: 2 Hours/ Week
Credits: 2

Examination Scheme
In-Semester: 50 Marks

Course Objectives:

1. To enable the student to have good health.
2. To practice mental hygiene.
3. To possess emotional stability

Course Outcomes:

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CC202 Liberal Learning Course-2
C: Yogasana & Meditation

After completion of the course, students will be able to

CO1: Demonstrate Flexibility and Mobility & Lung capacity through Practice of Asanas.
CO2: Practice Stress Management through Meditation & Mental wellbeing.
CO3: Explain common Health Problems and their Remedies.

Unit I: **Introduction – Yoga**

Introduction - Preparatory Movements/ Loosening Exercise, Suryanamaskar
Science of Yoga and Breathing Techniques, Dwipad Uttanasana, Setubandhasana, Markatasana, Pawanmuktasana Kriya, Markatasana Variation,, Sarvangasana (Shoulder Stand), Bhujangasan, Salabhasana, Adho Mukha Svanasana, Naukasana, Padmasana Yog Mudra, Vajrasana Yog Mudra, Naukasana, Paschimottanasana, Akarna Dhanurasana, Vakrasana, Ardha Matsyendrasana, Tadasana , Vrikshasana , Virasana, Ugrasana , Trikonasana, Garudasana, Nataraj Asana

Unit II **Pranayam and Meditation**

Preparation For Pranayam, Experience of Relaxation, Shuddhi Kriya- Kapalbhati, Deep Breathing, Fast Breathing (6 Types), Pranayam and Meditation, Anulom Vilom, Brahmari, Ujjayi, Meditation / Omkar, Dhyan

Reference Books:

1. Yoga Pravesh – Yogacharya Dr. Vishwas Mandlik
2. Yoga Parichay – Yogacharya Dr. Vishwas Mandlik

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PCCEC201: Principles of Communication Systems

Teaching Scheme:
Lectures:2 Hours / Week
Credits: 2

Examination Scheme:
In Semester: 25 Marks
End Semester: 25 Marks

Course Objectives:

1. To introduce the basics of Electronic Communication.
2. To understand the basics of Analog communication and Digital Communication systems.
3. To understand modern communication systems.

Course Outcomes:

CO1: To explain basic communication systems and classify different types of signals.

CO2: To describe need of modulation and interpret analog modulation techniques.

CO3: To explain the sampling process and pulse modulation techniques.

CO4: To describe the need of digital communication with different modulation techniques.

CO5: To explain the evolution of wired and wireless communication systems.

UNIT I: Introduction to Electronic Communication:

Importance of communication, Elements of communication system, Types of electronic communication, signal bandwidth, channel bandwidth, Electromagnetic Spectrum, Types of Signals, Energy and power signal.

UNIT II: Basics of Analog Communication:

Baseband communication and its limitations, Need of Modulation, Types of modulation, Amplitude and Frequency modulation, modulation index, Bandwidth, Comparison of amplitude and frequency modulation.

UNIT III: Pulse Analog Modulation:

Sampling Process, Types of sampling, Sampling theorem, Aliasing, Aperture effect, Pulse analog modulation techniques - PAM, PPM, PWM.

UNIT IV: Basics of Digital Communication:

Elements of digital communication Need of digital communication over analog communication, Types of Multiplexing, Modulation Techniques: Amplitude Shift Keying (ASK), Phase Shift Keying (PSK), and Frequency Shift Keying.

UNIT V: Modern communication systems:

Optical communication system, Satellite Communication system, Radar, and Personal communication systems, IEEE standards for wireless networks, Generations of Wireless communication.

Text Books:

1. George Kennedy, **"Electronic Communication Systems"**, *McGraw-Hill*, (5th Edition), (2013).

2. Simon Haykin, Michael Moher, **"Communication Systems"**, *Wiley*, (5th Edition), (2009).

3. Frenzel, **"Communication Electronics"**, *Tata McGraw-Hill*, (3rd Edition). (2008)

Reference Books:

1. Bernard Sklar, **"Digital Communications Fundamentals and Applications"**, *Prentice Hall P T R*, (2nd Edition), (2009).

2. A. B. Carlson and P. B. Crilly, **"Communication Systems"**, *McGraw-Hill*, (5th Edition), (2002).

3. T. L. Singal, **"Analog and Digital Communication"**, *Tata McGraw-Hill*, (1st Edition), (2012).

PCCIN201 Principles of Measurement and Automation System

Teaching Scheme:
Lectures: 2 hrs/week
Credits: 2

Examination Scheme:
In Semester: 25 Marks
End Semester: 25 Marks

Course Objectives:

1. To acquire the basic knowledge of instrumentation system
2. To study principles and working of various sensing techniques
3. To select appropriate components for Instrumentation system

Course Outcomes:

On completion of this course, the student will be able to

CO1 Explain various measurement principles.
CO2 Define instrument characteristics.
CO3 Select appropriate measurement technique for given application.
CO4 Identify the components of automation system.

Unit I: Overview of Automation and measurement systems

Instrumentation system representation, static and dynamic characteristics, types of errors, basics of Calibration, overview of automation tools and applications

Unit II: Measurement principles of resistive sensors

Resistive type of measurement principles with few examples - NTC, PTC, potentiometric sensors, strain gauges

Unit III: Measurement principles of capacitive sensors

Capacitive type of measurement principles with few examples - variable overlapping area, variable dielectric medium, variable inter plate distance

Unit IV: Measurement principles of inductive and piezoelectric sensors

Inductive, piezoelectric and miscellaneous type of measurement principles with few examples

Text Books:

1. C.S. Rangan, G.R.Sharma, V.S.V.Mani - 'Instrumentation Devices and Systems'
2. B.C. Nakra, K.K.Chaudhary - 'Instrumentation Measurement and Analysis'
3. William D. Stanley - 'Operational amplifiers with Linear Integrated Circuits'
4. C.D. Johnson - 'Process Control and Instrument Technology'

Reference Books:

1. D. Patranabis - 'Principles of Industrial Instrumentation'
2. William Andrews - 'Applied Instrumentation in Process Industries'

PCCME201 Engineering Mechanics

Teaching Scheme	**Examination Scheme**
Theory: 2 Hrs/week	In semester: 25 Marks
Credits: 2	End semester: 25 Marks

Course Objectives:

1. To familiarize students with the **concepts of static equilibrium,** center of gravity and moment of inertia
2. To introduce the kinematics of particles and rigid bodies to find the velocity and acceleration
3. To introduce the kinetics of particles and rigid bodies to analyze the forces and moments

Course Outcomes:

After completing the course students will be able to

CO1 Apply the concept of force, moment, and static equilibrium in two- and three-dimensional systems with the help of FBD

CO2 termine the center of gravity and moment of inertia of the bodies

CO3 Analyse the motion of a particle to find the velocity and acceleration

CO4 **Analyse particles and rigid body in motion using force and acceleration, work-energy, and impulse-momentum principle**

Unit – 1 **System of Forces and Equilibrium:**
Two- and three-dimensional force system- rectangular components, Moment, Couple, Resultant, scalars and vectors, units,
Equilibrium - Equations of equilibrium, free body diagram, Equivalent force systems, Structures - 2D truss, method of joints, and method of section. Frame, beams, types of loading and supports

Unit – 2 **Center of Gravity, Centroid and Mass Moment of Inertia:** Centre of gravity, centre of mass and centroid, First and second moment of inertia and mass. Radius of gyration, parallel axis theorem

Unit – 3 **Kinematics of Particles and Rigid Body: Particles: Motion of particle with variable acceleration**. General curvilinear motion. Tangential & Normal component of acceleration, Motion curves (a-t, v-t, s-t curves). Application of concepts of projectile motion and related numerical,
Rigid Body: Translation, Rotation and General Plane motion of Rigid body. The concept of Instantaneous centre of rotation (ICR) for the velocity. Velocity analysis of rigid body using ICR.

Unit – 4 **Kinetics of Particles and Rigid Body: Particles: Force and Acceleration:** Introduction to basic concepts, D'Alembert Principle, concept of Inertia force, Equations of dynamic equilibrium, Newton's second law of motion. (Analysis limited to simple systems only.) **Work-Energy and**

Impulse-Momentum principle.

Rigid Body: Translation, fixed axis rotation, general planner motion, work-energy, power, potential energy, impulse-momentum and associated conservation principle, Euler equation of motion and its applications.

Text Books:

1. R. C. Hibbeler, 'Engineering Mechanics (statics and Dynamics), 12th Edition, *Pearson Publication*.
2. A. Nelson, 'Engineering Mechanics (statics and Dynamics), 12th Edition, *Mc Graw Hill Education*.

Reference Books:

1. Timoshenko and Young, 'Engineering Mechanics', *Tata Mc-Graw Hill,* New Delhi.
2. Mclean, and Nelson, 'Theory and problems of Engineering Mechanics (Statics and Dynamics)', *Schaum Series.*
3. Beer and Johnston, 'Vector Mechanics for Engineers-Dynamics' *McGraw Hill Education.*
4. Engineering Mechanics (Statics and Dynamics)', Dorling Kindersley (India) Pvt. Ltd. *Pearson Education.*
5. Dr. R. K. Bansal, Sanjay Bansal, 'A Text book of Engineering Mechanics', *Lakshmi publications*.

BSC102L Chemistry Lab

Teaching Scheme:
Practical:2 Hrs / week
Number of Credits: 1

Examination scheme:
In semester:25Marks

Course outcomes

After completion of this course a student should be able to

CO1 : Apply chemistry principles for quantitative analysis.

CO2 : Make use of an instrument for chemical analysis.

CO3 : Calculate chemical parameter based on recorded observations.

CO4 : Evaluate quality of coal and polymer based on their chemical properties.

CO5 : Prepare a chemical substance such as soap, zeolite, biopolymer etc. based on experimental procedure.

LIST OF EXPERIMENTS:

1. Determination of total hardness of sample water by EDTA Method (complexometric titration)
2. Determination of total alkalinity of sample water.
3. Measuring EMF of electrochemical cell to predict spontaneity as well as to calculate Gibb's free energy and equilibrium constant.
4. Viscometric method to determine Molecular weight of a Polymer.
5. Estimation of sodium from given solution using flame photometry.
6. Colorimetric estimation of $KMnO_4$ from solution.
7. Proximate analysis of coal samples and Comment on it's quality.
8. Laboratory preparation of soap.

ESC102L Basic Electrical and Electronics Engineering Lab

Teaching Scheme:

Practical: 2 Hrs./Week

Number of Credits: 1

Examination Scheme:

In semester: 25Marks

Course Outcomes:

After completion of course, students will be able to

CO1: Perform basic domestic wiring

CO2: Apply circuit laws to find the parameters of given electrical network

CO3: Build a basic regulated DC power supply

CO4: Obtain frequency response of CE amplifier

CO5: Build basic digital circuits

List of experiments:

- Introduction of different electrical and electronics components and instruments.
- To perform electrical wiring to control lamps using one way and two-way switches.
- To verify Thevenin's theorem & superposition theorem.
- To determine phase angle of L-C-R series circuit.
- To perform load test on single phase transformer to determine regulation andefficiency.
- To determine output voltage and ripple voltage of half wave, full wave rectifier withcenter tap transformer and bridge rectifier with and without filter.
- Assemble and build simple DC regulated power supply.
- To determine frequency response of CE amplifier.
- Assemble and build half adder & full adder circuits.

VSEC201 Programming Skills in Python Language

Teaching Scheme:
Practical: 4 Hours/week
Credits: 2

Examination Scheme:
In Semester: 25 Marks
End Semester: 25 Marks

Prerequisites: Basic Mathematics.

Course Objectives:

Familiarize students with

1. The fundamentals of Python programming for logic building.
2. Appropriate data types, operators of Python language.
3. Conditional statements and loops in Python programming language.
4. List, strings, functions, and structures of Python programming language.

Course Outcomes:

Students will be able to:

1. Implement programs to solve real-life problems.
2. Implement Python programs using appropriate control structures, data type, operators and functions.
3. Execute Python programs.
4. Test Python programs for various inputs.

Suggested list of assignments:

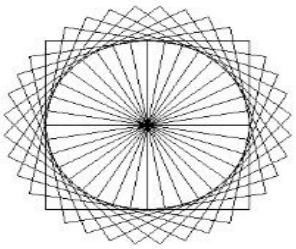
1. Demonstration of installation and configuration of Anaconda and Spyder.
2. Accept and display class names and roll numbers of all the students from your class.
3. Create an empty dictionary for the film database, add films to the dictionary, update the key value and display all details of films.
4. Create an empty list of districts. Insert districts of Maharashtra, append districts of Gujarat, extend districts of Kerala, search for specific districts, access the first 5 districts, remove any one district and display all districts.
5. A) Create an empty tuple of cricket player names. Add a few player names to the tuple and display all the players in the tuple.
   B) Swap positions of two players using tuples and display the initial and swapped contents of the tuples.
6. Perform string manipulation functions (concatenation, substring, comparison, palindrome)
   a. Display your first name
   b. Concatenate your last name to first name
   c. Find substring “as” in your concatenated string
   d. Compare your first name with your friends first name and specify if it’s same
   e. Check if following strings are palindrome or not
      i. Your first name
      ii. nitin
      iii. madam
      iv. noon
      v. Your friend's name.
7. Create a text file and add course outcomes of this course. Implement file operations on it.
8. Calculate area of the circular cricket ground for a given radius using:
   a. formula

b. Inbuilt function from numpy library.

9. Plot sin(x) and cos(x) functions for values of x between 0 and pi. Use inbuilt libraries numpy and matplotlib.
10. Create a class named Person and assign values for name and age.
11. Implement a mini project based on String, function, directory, tuple and list.

Extra assignments:

1. Find out maximum and minimum salary of employee.
2. Calculate factorial using functions.
3. Generate fibonacci series using recursion.
4. Print multiplication table from 1 to 10
5. Design a two-player Rock-Paper-Scissors game
6. Python program to draw a circle of squares using Turtle



7. Generate a random number between 1 and 9 (including 1 and 9). Ask your friend to guess the number, then tell them whether they guessed too low, too high, or exactly right.
8. Company gives a dearness allowance 45% of basic salary and house rent allowance is 25% of basic salary. Write a python program to calculate gross salary.

Text books:

1. Reema Thareja, "Python Programming using problem solving Approach", Oxford University, Higher Education Oxford University Press; First edition (10 June 2017), ISBN-10: 0199480173
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Interdisciplinary Approach", Pearson India Education Services Pvt. Ltd., 2016.
3. 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:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think- python/)
2. Michael B. Feldman and Elliot B. Koffman. "Ada95: Problem Solving and Program Design", Addison-Wesley, Reading, Massachusetts, 1996.
3. Fredrik Johansson et al., "Mpmath: a Python library for Arbitrary-Precision Floating Point Arithmetic", December 2013. http://mpmath.org/.