

**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. Computer Engineering and Information Technology 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	
BSC101	Physics	3	0	0	<b>3</b>	50	50	0	100
BSC201	Multivariate Calculus	3	1	0	<b>4</b>	50	50	0	100
ESC101	Engineering Graphics	2	1	0	<b>3</b>	50	50	0	100
ESC203	Sustainable Engineering	3	1	0	<b>4</b>	50	50	0	100
CC202	Liberal Learning Course-2	1	0	2	<b>2</b>	50	0	0	50
*PCCxx201	Programme core Course	2	0	0	<b>2</b>	25	25	0	50
BSC101L	Physics Lab	0	0	2	<b>1</b>	25	0	0	25
ESC101L	Engineering Graphics Lab	0	0	2	<b>1</b>	25	0	0	25
#VSEC201L	Programming Skills in Python/Java Language	0	0	4	<b>2</b>	25	0	25	50
Total =		<b>14</b>	<b>03</b>	<b>10</b>	<b>22</b>	<b>350</b>	<b>225</b>	<b>25</b>	<b>600</b>

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

\*PCCCE201: Object Oriented Paradigms in Java

\*PCCIT201: Networking Essentials

#VSEC201L: Programming Skills in Python Language for IT students

#VSEC201L: Programming Skills in Java Language for Computer Engineering students

## **BSC101 Physics**

### **Teaching Scheme**

Lecture 3 Hrs/week

Credits: 3

### **Examination Scheme:**

In-semester: **50** Marks

End-semester: **50** Marks

### **Course Objectives:**

1. To offer broad areas of Physics which are required as an essential background for engineering students.
2. To develop students' ability to understand fundamental principles of electromagnetism, optics, statistical physics, and quantum physics, and apply these concepts effectively to solve problems.
3. To develop critical thinking in analyzing the properties of materials at bulk and nanoscales.

### **Course Outcomes:**

After completion of this course a student should be able to

**CO1:** Apply the generalized Coulomb law and the law of Electromagnetic Radiation to determine the electric fields due to the stationary and the accelerated charges.

**CO2:** Apply the laws of Physical Optics to determine intensity distributions of interference – diffraction patterns, and to identify polarization-types.

**CO3:** Apply the principles of Statistical Physics to determine the thermal distribution of matter in different energy states and the thermal response of engineering materials.

**CO 4:** Justify the selection of — quantum probability rules and single qubit logic gates.

**CO 5:** Differentiate between the physical properties of 'nano' materials and of their 'bulk' counterparts.

### **Course Content:**

#### **Unit 1: Electromagnetic Radiation and Interference:**

Expression for the electric field beyond Coulomb's law; Two dipole radiators and Physics of interference; Mathematical treatment (propagating waves, rotating vectors, complex functions)

#### **Unit 2: Diffraction and Polarization:**

The resultant amplitude due to equal oscillators; Diffraction Grating; The electric vector of light; Types of Polarized Light; Birefringence; Polarizers

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**Unit 3: Statistical Mechanics and Thermodynamics:**

Principles of Statistical Mechanics (Distribution of particles in thermal equilibrium); Laws of Thermodynamics (Carnot Cycle, Entropy, Clausius-Clapeyron Equation); Information Entropy

**Unit 4: Quantum Physics:**

Laws of combining probability amplitudes; The Hamiltonian matrix & Schrödinger equation; Two-state systems: Pauli spin matrices & Photon polarization states; Single Qubit Logic Gates

**Unit 5: Properties of Solids:**

Band Theory; Electrical (conductivity, resistivity), Magnetic (dia-para-ferro), Optical (absorbance, reflectance, transmittance), Mechanical (hardness, elasticity) properties (of 'bulk' & 'nano' solids)

**Text Book:**

R. P. Feynman, R. B. Leighton and M. Sands, 'The Feynman Lectures on Physics',  
*Pearson Education* (2006)

**Reference Books:**

- 1 J. Walker, D. Halliday, R. Resnick, 'Principles of Physics', Wiley *Student Edition* (10<sup>th</sup> Edition)
- 2 H. Young and Roger Freedman, 'University Physics', Pearson Addison Wesley (12<sup>th</sup> Edition)

## **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 functions.
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**

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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*, (40<sup>th</sup> edition), (2008).
3. Hughes-Hallett et al., '**Calculus - Single and Multivariable**', *John-Wiley and Sons*, (3<sup>rd</sup> Edition), (2003).
4. Maurice Weir, Joel Hass, '**Thomas' Calculus**', *Pearson India*, (13<sup>th</sup> edition), (2016).

#### Reference Books:

1. J. E. Marsden, A. J. Tromba and A. Weinstein, '**Basic Multivariable Calculus**', *Springer*, (3<sup>rd</sup> edition), (1993).
2. G. B. Thomas and R. L. Finney, '**Calculus and Analytic geometry**', *Pearson*, *Reprint* (9<sup>th</sup> 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* (4<sup>th</sup> edition), (2009).



## **ESC101 Engineering Graphics**

### **Teaching Scheme:**

Theory: 2 Hrs/week  
Tutorial: 1 Hr/week  
Credits: 3

### **Examination Scheme:**

In semester: 50 Marks  
End semester: 50 Marks

### **Course Objectives:**

1. To develop the visualization and interpretation skills for the physical objects.
2. To provide the basic knowledge and develop the skills for creating 2 D drawings.
3. To provide the basic knowledge and develop the skills for creating Isometric views.
4. To familiarize about the development of solids.
5. To familiarize the construction and applications of Engineering Curves.

### **Course Outcomes:**

After completing the course students will be able to draw

**CO1:** Orthographic and sectional orthographic projections of an object

**CO2:** Isometric views of the given object

**CO3:** Development of surfaces of the given object

**CO4:** Engineering curves by applying the given method.

### **Unit 1**

Introduction: Layout and sizes of drawing sheets, drawing instruments, types of lines used in drawing practice, dimensioning systems, representation of tolerances, standard codes by B.I.S (SP- 46). (Not for Examination)

### **Unit 2**

Orthographic Projection: Theory of projections, methods of obtaining orthographic views, sectional orthographic projections, Missing views.

### **Unit 3**

Isometric Views: Isometric axes, Isometric scale, isometric projections and views, construction of isometric view from given orthographic views

## **Unit 4**

Development of Solids: Parallel line development, radial line development, methods to transfer points for development of prisms, pyramids, cylinder and cone.

## **Unit 5**

Engineering Curves: Construction of ellipse, parabola, hyperbola, involute, cycloid, Archimedean spiral, helix on cone and cylinder.

### **Text Books:**

1. N. D. Bhatt and V. M. Panchal, 'Engineering drawing, plane and solid geometry', Charotar Publication House.
2. R. K. Dhawan, 'A text book of Engineering Drawing', Pearson Education Inc.
3. P.S. Gill, 'Engineering Graphics', Kataria and sons Publications.
4. M. L. Dabhade, 'Engineering Graphics', Vision Publications.

### **Reference Books:**

1. Warren J. Luzzader, 'Fundamentals of Engineering Drawing', Prentice Hall of India, New Delhi.
2. Frederick E. Giesecke, Alva Mitchell, 'Principles of Engineering Graphics', Maxwell
3. Dhananjay A. Jolhe, 'Engineering Drawing', Tata McGrawHill Publishing Co. Ltd.

## **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 of 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**

### **A: Introduction to Personnel Psychology**

#### **Teaching Scheme**

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

#### **Examination Scheme**

In-Semester: 50 Marks

#### **Course Objectives:**

1. To create awareness about the corporate world.
2. To understand one's personality
3. To understand the importance of self-management

#### **Course Outcomes:**

After completion of the course, students will be able to

- CO1:** Apply principles of psychology to improve self-awareness, teamwork & communication skills
- CO2:** Communicate clearly & empathetically in personal & professional interactions.

#### **Unit I: Know and accept your personality**

Johari window and Big Five model, Locus of control, SWOT analysis

#### **Unit II: Behaviour modification**

Self-improvement plan, goal setting, developing a positive attitude, Thinking skills

#### **Unit III: Stress management**

Causes of stress and ways to manage it, Emotional Intelligence (EI), Irrational beliefs and Rational Emotional Behaviour Therapy

#### **Unit IV: Corporate world**

Career anchors, Career patterns, Career roles, Personal effectiveness

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**Reference Books:**

1. "Our Constitution: An Introduction to India's Constitution and Constitutional Law" by Subhash Kashyap
2. "Psychology Applied to Work" by Paul M. Muchinsky and Satoris S. Culbertson

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**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](http://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:**

**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

## **PCCCE201 Object Oriented Paradigm in Java**

### **Teaching Scheme:**

Lecture: 2 Hr/week

Credits: 2

### **Examination Scheme:**

In-Sem: 25 Marks

End-Sem: 25 Marks

### **Course Objectives:**

To facilitate the learners:

1. To Apply object-oriented concepts for given problems.
2. Construct readable and reusable code using inheritance, abstract class, interface and polymorphism.
3. Understand the significance of Exception handling in Java.
4. To design and implement an application using Java Programming.

### **Course Outcome:**

By taking this course, the learner will be able to:

**CO1:** Make use of object oriented programming concepts using Java such as Class, Object constructor and control structures for program development.

**CO2:** Apply polymorphism and Inheritance for readability and reusability of code.

**CO3:** Apply concepts of abstract class, interface and packages for program development.

**CO4:** Demonstrate Exception handling concepts using in-built classes and user defined exceptions.

### **Course Content:**

#### **Unit-I : Introduction to Object Oriented Paradigm in Java**

Need of object-oriented paradigm, basic concepts of object oriented programming (OOP), benefits of OOP. General characteristics for OOP, History of Java, Features of Java, Java and Internet, Java virtual machine, First java Program, Command line arguments, Java Programming elements: Data types, Control Structures, Encapsulation, Abstraction and Polymorphism, Class, object, constructor  
Illustration through real life examples and use cases.

#### **Unit-II: Polymorphism and Inheritance**

Function overloading, argument passing, constructor overloading, this, static, final keywords.

Types of inheritance, base class and derived class, access specifiers, method overriding.  
runtime polymorphism.

Illustration through real life examples and use cases.

### **Unit-III: Abstract Class and Interfaces**

Abstract class, interfaces, dynamic method dispatch, package, Java Collection Framework overview -  
ArrayList, Stack

Illustration through real life examples and use cases.

### **Unit-VI: Exception Handling in Java**

Errors and Exceptions, Types of exceptions, try, catch, throw, throws and finally keywords, Build-in  
exceptions, creating and using custom exceptions.

Illustration through real life examples and use cases.

Advance Java Concepts - Java Frameworks, Java for Application development, Java Full Stack  
Technologies, JAVA APIs.

### **Text Books:**

1. Herbert Schilt, "**JAVA Complete Reference**", *Tata McGraw Hill*, (9<sup>th</sup> Edition), (2014)
2. Eckel B., "**Thinking in Java**", *Pearson Education*, (3<sup>rd</sup> Edition)

### **Reference Books:**

1. Kathy Sierra & Bert Bates, "**Head First Java**", *Oreilly publication*, (2<sup>nd</sup> Edition) (2009)
2. Barry Burd "**Beginning Programming with Java for Dummies**", *Oreilly publication*, (5<sup>th</sup> Edition) (2017)
3. Paul Deital and Harvey Deital, "**Java How to program**", *Prentice Hall Publication*, (9<sup>th</sup> Edition) (2011)



## **PCCIT201 Networking Essentials**

### **Teaching Scheme:**

Lectures: 2 Hrs/Week

Tutorial: -

Credits: 2

### **Examination Scheme:**

In-Semester: **25** Marks

End-Semester: **25** Marks

### **Course Objectives:**

Familiarize students with the

1. Networking topologies.
2. Functionality of OSI data link layer and the key protocols associated with it.
3. Different media access control schemes.
4. Error detection mechanisms.

### **Course Outcomes:**

After completion of this course, students will be able to

**CO1:** Select appropriate network topologies for various network scenarios.

**CO2:** Analyze various functions of OSI data link layer in data transmission.

**CO3:** Apply appropriate media access control methods.

**CO4:** Apply suitable error detection and correction mechanisms.

### **Course Content:**

#### **Unit – I: Introduction to Networking**

The Architecture of the Internet, Principles of Layering and Encapsulation, Types of Networks: LAN, WAN, and MAN, Overview of Networking Devices, Introduction to Network Topologies, Point-to-Point and Point-to-Multipoint Topologies, LAN and WAN Design Demonstrations, Group Discussion: Analysing Network Designs

#### **Unit – II: Network Models and Protocols**

Communication Platforms and Networking Protocols, Introduction to the OSI Model, Understanding the TCP/IP Model, Protocol Data Units (PDUs) and Encapsulation, Comparing the OSI and TCP/IP Models, Network Addressing Schemes, Case Study: Protocol Analysis and Comparison, Demonstrations: OSI and TCP/IP Models

#### **Unit – III: Data Link and Ethernet**

Introduction to Ethernet, Ethernet Basics: Collision and Broadcast Domains, CSMA/CD and Half / Full-Duplex Ethernet, Data Link Layer Functions and Design Issues, Ethernet addressing and Frame Structure, Channel Bonding and Aggregation, Error Detection and Correction in Data Link Layer, Demonstrations: Ethernet Setup and Frame Analysis

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#### **Unit – IV: Linear Block Codes and Physical Layer**

Introduction to Linear Block Codes, Basics of Error-Correcting Codes, Linear Block Code Properties and Encoding, Decoding Linear Block Codes: Syndrome Decoding, Error Detection and Correction in Linear Block Codes, Transmission Media: Guided and Unguided

Demonstrations: Linear Block Code Encoding and Decoding, Carrier Sense Multiple Access Protocol

#### **Text books:**

1. Behrouz A. Forouzan, "**Data Communications and Networking**," McGraw Hill Education (5E), ISBN: 978-0072967753
2. Jeffrey S. Beasley and Piyasat Nilkaew, "**Networking Essentials**," Pearson, ISBN-13: 978-0134872023
3. Cisco Press, "**Network Fundamentals**"

#### **Reference Books:**

1. Olivier Bonaventure, "**Computer Networking: Principles, Protocols and Practice**"
2. Harjinder Singh, "**Computer Networking: Principles and Protocols**"
3. William Stallings, "**High-Speed Networks and Internets: Performance and Quality of Service**"
4. Andrew S. Tanenbaum, "**Computer Networks**," Pearson (6th edition, 2021)

### **BSC101L Physics Lab**

**Teaching Scheme:**

Practical: 2 Hrs. / Week

Number of Credits: 1

**Examination Scheme:**

In semester: 25Marks

**Course Objectives:**

The objective of the Physics Lab course is two-fold:

To inculcate experimental skills, and

To demonstrate the interplay between theoretical & experimental physics.

**Course outcomes:**

After completion of this course a student should be able to

**CO 1:** Record the observations as per the least counts of measuring instruments and perform necessary calculations.

**CO 2:** Compare the experimental findings with the corresponding theoretical physics models.

**CO 3:** Determine errors in experimental findings and Analyze their sources and causes.

**CO 4:** Reach the conclusions pertaining to the observed behavior of physical systems.

**List of Experiments:**

Physical Optics Experiments:

I. Polarization of light, II. Diffraction Grating: Emission Spectra, III. Michelson Interferometer, and IV. Newton's Rings.

Electromagnetism & Heat Experiments:

I. Dia-Para-Ferromagnetism: Magnetic Permeability, II. Faraday's Law, and III. Hysteresis (B-H) Curve of Iron core, IV: Specific Heat of solid materials.

Modern Physics Experiments:

I. Planck's Constant, II. I - V Characteristic of LED, III. Hall Effect, and IV. Zeeman Effect.

## **ESC101L Engineering Graphics Lab**

### **Teaching Scheme:**

Practical: 2 Hrs./week  
Credits: 1

### **Examination Scheme:**

In Semester: 25 marks

### **Course Objectives:**

#### **To familiarize student about**

1. Advantages of using software for Engineering drawing
2. 2-D drafting using a software
3. 3-D modeling using a software
4. 3-D printing technology

### **Course Outcomes:**

After completing the course using a software package students will be able to

**CO1:** Draw orthographic projections of a given component.

**CO2:** Draw Isometric projections of a given component.

**CO3:** Draw development of solids

**CO4:** Draw free hand sketches of the machine elements.

### **Part I**

#### **Introduction to 2-D Drafting using a drafting software**

- Orthographic Projections
- Isometric Projections
- Development of surfaces of solids
- Free hand sketching of standard machine elements

### **Part II**

#### **Demonstration of 3-D Modeling and 3-D Printing**

Creating a 3-D model of a simple component using a solid modeling software and manufacture using a rapid prototyping technique.

### **Text Books:**

N. D. Bhatt and V. M. Panchal, '*Engineering drawing, plane and solid geometry*', Charotar Publication House.

M.L.Dabhade, '*Engineering Graphics*', Vision Publications.

Bethune, J.D., '*Engineering Graphics with AutoCAD 2013*', PHI Learning Private Limited, Delhi, 2013

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The objective of the Physics Lab course is two-fold:  
To inculcate experimental skills, and  
To demonstrate the interplay between theoretical & experimental physics.

**Course outcomes:**

After completion of this course a student should be able to

- CO 1:** Record the observations as per the least counts of measuring instruments and perform necessary calculations.
- CO 2:** Compare the experimental findings with the corresponding theoretical physics models.
- CO 3:** Determine errors in experimental findings and Analyze their sources and causes.
- CO 4:** Reach the conclusions pertaining to the observed behaviour of physical systems.

**List of Experiments:**

Physical Optics Experiments:

II. Polarization of light, II. Diffraction Grating: Emission Spectra, III. Michelson Interferometer, and IV. Newton's Rings.

Electromagnetism & Heat Experiments:

I. Dia-Para-Ferromagnetism: Magnetic Permeability, II. Faraday's Law, and III. Hysteresis (B-H) Curve of Iron core, IV: Specific Heat of solid materials.

Modern Physics Experiments:

II. Planck's Constant, II. I - V Characteristic of LED, III. Hall Effect, and IV. Zeeman Effect.

## **VSEC201L Programming Skills in Java Language**

### **Teaching Scheme:**

Practical: 4 Hr/week

Credits: 2

### **Examination Scheme:**

In-Sem: 25 Marks

End-Sem : 25 Marks

### **Course Objectives:**

To facilitate the learners:

1. To explore the principles of object oriented programming
2. To apply object oriented programming concept for developing applications using Java
3. To make use of class, object and constructor for coding basic object oriented program
4. To handle built-in and user defined exceptions

### **Course Outcome:**

By taking this course, the learner will be able to:

CO1: Apply basic object oriented constructs of Java such as class, object, data types, control flow, constructor for program development.

CO2: Develop readable and reusable code using inheritance and polymorphism

CO3: Make use of exceptions using inbuilt classes and user defined exceptions

CO4: Develop application using object oriented programming language Java to solve real life problem

### **Suggestive List of Assignments**

**Assignment 0:** Get acquainted with Windows/Linux Platform, Java environment, IDE installation, structure of basic Java program, compilation, debugging and execution of Java program.

### **Group A: Java Language Constructs**

1. Write a MyDate class which has attributes as day, month and year. Create five objects of MyDate and display them.

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2. Write a Java program to simulate the traffic signal by creating a class called "TrafficLight" with attributes for color and duration, and methods to change the color of the signal.
3. Write a Java program that displays the number of characters, lines and words in a text.
4. A circle has a radius. Its area can be calculated. The area is a double number. Its perimeter can be calculated as  $2\pi r$ . The perimeter is a double number. Given two circles one can find out which is large and which is small. Create two circles c1 and c2 with radius as 10 and 7 respectively. Calculate the area and perimeter of each. Compare two circles with each other and display which is large and which is small.
5. Design, code, test, and debug a user defined abstract data type 'Complex' in Java. Write a program using polymorphism to perform arithmetic operations of two complex numbers.
6. Write a Java program using inheritance to create a base class Sports with a method called play(). Create three subclasses: Football, Basketball, and Rugby. Override the play() method in each subclass to play a specific statement for each sport.
7. Write a Java program to create a class called Employee with methods called work() and getSalary(). Create a subclass called HRManager that overrides the work() method and adds a new method called addEmployee().
8. Write a Java program to create an interface Shape with the getArea() method. Create three classes Rectangle, Circle, and Triangle that implement the Shape interface. Implement the getArea() method for each of the three classes.
9. Write a Java program that works as a simple calculator to perform +, -, \*, % operations. Handle any possible exceptions like divide by zero.
10. Write a Java program to implement Java Collection Frameworks like Stack and List.
11. Write a Java program to create a method that takes an integer as a parameter and throws an exception if the number is odd.
12. Write a Java program to create a method that takes a string as input and throws an exception if the string does not contain vowels.

### Group B: Applications of Language Constructs

1. Create a student result database in Java. Calculate the grades of students. Decide criteria for best student and short-list students who satisfy the criteria.

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- a) A student has a roll No, name, marks in five courses and a grade. A student list has many students. If a student has grade equal or beyond 8, he is considered as a top band student.
  - b) Create at least ten students. From these, find all such students which satisfy the criteria of top band student. Create a list of such students and display the students in the list.
2. Create an application like a bookshop and maintain the inventory of books that are being sold at the shop. Reading material has a title and price. A book is a reading material. It has an ISBN number. A magazine is a reading material, it has a month of issue. A CD is a reading material, it has duration in minutes. Represent the above description as a generalization, specialization tree. Identify the parent class, its attributes, child class and their attributes. Implement and Test all of them.
  3. Find appropriate class hierarchy, polymorphic behavior in applications like banking and implement it.
  4. Model the HRD application using the concepts of inheritance, interface, polymorphism
  5. Write a program to simulate the operations of a restaurant by creating appropriate classes and attributes and methods.
  6. A company has many employees of different designations with different perks and deductions. When an employee is appointed, he is assigned with an employee Id, designation and perks. One can ask for the total salary of the employee and take-home salary of the employee. Identify a class/classes and relationships (is-a / has-a) from the above statement, identify the attributes, the data types, the behavior. Test your program for ten employees.
  7. A vehicle has engine no and chassis number. It can be locked, unlocked. Every vehicle is movable (interface). It can be started, stopped, turned, accelerated, turned, and decelerated. A car is a vehicle. It has steering. An airplane is a vehicle. It has wings. A boat is a vehicle. It has a propeller. Identify a class/classes/interfaces from the above statement, identify the attributes, the data types, the behavior. Test your program for different types of vehicles.
  8. Write a Java program to create a class called "Library" with a collection of books and methods to add, display and remove books, issue and return of books.

**Group C problem statements address big real life problem solving. Students are expected to apply the learnt concepts to solve these problems. Students should choose any one of the following:-**



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1. Students should simulate real life problems/scenarios/applications. They are expected to make use of the appropriate constructs of Java language (Advanced Java concepts can be used)
2. Debugging and Feature enhancement / Alternative solution / testing / Code-refactoring of given problem statement. Students will be given a large and ready code. Students are expected to read and understand the code , be able to debug the code, be able to enhance the feature in given code, to be able to find alternative solutions, or refactor the given code.

## **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:**

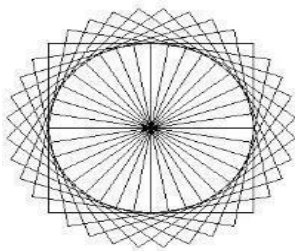
1. Demonstration of installation and configuration of Anaconda and Spyder.
2. Accept and display class names and roll numbers of all the students from your class.
3. Create an empty dictionary for the film database, add films to the dictionary, update the key value and display all details of films.
4. 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.

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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. The 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", 2<sup>nd</sup> 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/>.