# List of Open Elective Courses – VII Semester B.E.
**Academic Year – 2023-24**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course Code</th>
<th>Title of Open Elective</th>
<th>Max. No. of Students</th>
<th>Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>CV7001</td>
<td>Geospatial Technology</td>
<td>60</td>
<td>Civil Engineering</td>
</tr>
<tr>
<td>2.</td>
<td>CV7003</td>
<td>Occupational Safety And Health</td>
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<tr>
<td>3.</td>
<td>CV7005</td>
<td>Air Pollution And Control</td>
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<td>4.</td>
<td>ME7006</td>
<td>Microgrid Systems</td>
<td>60</td>
<td>Mechanical Engineering</td>
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<td>5.</td>
<td>ME7008</td>
<td>Organizational Behaviour</td>
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<td>6.</td>
<td>ME7009</td>
<td>Industrial Internet of Things</td>
<td>60</td>
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<tr>
<td>7.</td>
<td>EC7001</td>
<td>Internet of Things</td>
<td>120</td>
<td>Electronics &amp; Communication Engineering</td>
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<tr>
<td>8.</td>
<td>EC7002</td>
<td>FPGA based Embedded Systems</td>
<td>60</td>
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<td>9.</td>
<td>EE7002</td>
<td>Power Electronic devices and applications</td>
<td>60</td>
<td>Electrical &amp; Electronics Engineering</td>
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<tr>
<td>10.</td>
<td>EE7004</td>
<td>Smart grid and RE integration</td>
<td>60</td>
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<td>11.</td>
<td>EE7005</td>
<td>Agricultural Engineering</td>
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<td>Industrial &amp; Production Engineering</td>
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<tr>
<td>12.</td>
<td>IP7001</td>
<td>Supply Chain Management</td>
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<td>13.</td>
<td>IP7003</td>
<td>Lean Practices</td>
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<td>14.</td>
<td>CS7003</td>
<td>Introduction To Python Programming</td>
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<td>Computer Science &amp; Engineering</td>
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<tr>
<td>15.</td>
<td>IS7001</td>
<td>OOPs with C ++</td>
<td>60</td>
<td>Information Science &amp; Engineering</td>
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<tr>
<td>16.</td>
<td>IS7003</td>
<td>Introduction to Cyber Security</td>
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<td>17.</td>
<td>PH7001</td>
<td>Introduction to Nanotechnology</td>
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<td>Physics</td>
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<td>18.</td>
<td>PH7002</td>
<td>Quantum Computing</td>
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<tr>
<td>19.</td>
<td>CH7001</td>
<td>Nanocomposites for Engineering Applications</td>
<td>60</td>
<td>Chemistry</td>
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<tr>
<td>20.</td>
<td>MA7001</td>
<td>Linear Algebra</td>
<td>60</td>
<td>Mathematics</td>
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</tbody>
</table>

**Note:**

1. Students can opt for **ANY ONE** Open Elective course from the above mentioned list offered by other departments except their own/ allied department.
2. The Maximum number of students for an Open Elective Course will vary from department to department.
3. The minimum number of students for each course shall be 30. If an open elective course has less than 30 intake, then such courses will not be offered and those students will be shifted to the other course based on the availability.
4. Once the maximum number of students opting for a particular Open Elective Course is reached, the student has to opt for other Open Elective Course based on the availability.
5. The detailed Curriculum has been attached for reference.

Copy to:
1. The Principal/ Vice Principal – for information
2. COE/ SDSC/ Head-IQAC
3. HoDs of CIV / MEC / EEE / ECE / IP/ CSE / ISE / Maths. /Phy./Che./ Time Table Committee Chairman
Open Elective
GEOSPATIAL TECHNOLOGY (2:0:0)

Sub Code : CV7001  CIE : 50% Marks
Hrs/Week : 2+0+0  SEE : 50% Marks
SEE Hrs : 02 Hrs  Max. Marks : 50

Course Outcomes
Upon successful completion of this course student will be able to:
1. Describe and discuss concepts of spatial data and maps.
2. Describe and discuss concepts of remote sensing and satellites.
3. Articulate the use of geospatial technology for various applications.

Module - I
Concepts of Spatial data and Maps
Concept of spatial data, need for spatial data, Data acquisition methods, ground based and image based methods of data acquisition. Concept of spatial data, need for spatial data, data acquisition. Maps, map reading, coordinate systems, map projections, datums. Introduction to GPS, segments, working principle.

Self Learning Exercise: List of open source spatial data sources.

8 Hrs

Module - II
Foundations of Remote sensing, Platforms and Image interpretation

Self Learning Exercise: Characteristics of Indian and other major earth resource satellites.

10 Hrs

Module - III
Fundamentals of Geographic information systems and Applications
Introduction, basics of GIS- definition of GIS, components of GIS, GIS work flow, representing spatial data, raster and vector data. Data analysis using GIS. Applications of remote sensing, GIS and GPS. Land use/cover mapping, Pandemic mapping, Urban and regional planning applications, Disaster management applications.

Self Learning Exercise: Common image processing and GIS software.

8 Hrs

Text Books

Reference Books:
OCCUPATIONAL SAFETY AND HEALTH (2:0:0)

Sub Code : CV7O03  
CIE : 50% Marks

Hrs/Week : 2+0+0  
SEE : 50% Marks

SEE Hrs : 02 Hrs  
Max. Marks : 50

Course Outcomes
Upon successful completion of this course, students will be able to:
2. Identify hazards, assess the risks, and manage the consequences.
3. Perform a safety audit.

Module- I
Introduction to OSH

8 Hrs

Self Learning Exercise: Workmen’s compensation act 1923

Module - II
Risk management principles and techniques

10 Hrs

Self Learning Exercise: ETA and FTA

Module- III
Hazards, risks and safety audits

8 Hrs

Self Learning Exercise: Ergonomics

Text Books
1. Industrial Safety Sectional Committee CHD 8, IS 14489: 2018, “Occupational health and
safety audit - Code of practice (First Revision)”, Bureau of Indian Standards.


Reference Books
AIR POLLUTION AND CONTROL (2:0:0)

Sub Code : CV7O05
Hrs/Week : 2+0+0
SEE Hrs : 02 Hrs

CIE : 50% Marks
SEE : 50% Marks
Max. Marks : 50

Course Outcomes
Upon successful completion of this course, students will be able to:
1. Describe sources of air pollution and pollutants
2. Discuss meteorological effects and air pollution
3. Articulate air pollution control systems

Module -I
Sources of air pollution, effects on ecosystem. Classification of pollutants – particulates, hydrocarbons, carbon monoxide, oxides of sulfur, nitrogen, photochemical oxidants. Elemental properties of the atmosphere – scales of motion, heat, pressure, wind, moisture, relative humidity.

Self Learning Exercise: Air pollution episodes of environmental importance

Module-II
Influence of meteorological phenomenon on air quality – Lapse rates and dispersion, pressure system and dispersion, winds and dispersion, Modeling: maximum mixing depth, dispersion models, Temperature Inversions, Windrose diagram. Stack emissions, plume behavior, heat island effect.

Self Learning Exercise: Episodes of heat island effect of environmental importance

Module-III

Self Learning Exercise: Indoor Air Pollution – sources, effects and control

Text Book

Reference Books
1. Noel De Nevers, “Air Pollution Control Engineering”, Waveland Pr Inc.
5. Martin Crawford “Air Pollution Control Theory” Tata McGraw Hill Publication
MICRO-GRID SYSTEM (2-0-0)

Sub Code : ME7006
Hrs / Week : 02
SEE Hrs : 2 Hrs

CIE : 50 %
SEE : 50 %
Max. Marks : 50

Course Outcomes

Upon successful completion of this course, the student will be able to:


3. Describe various energy storage systems and demonstrate the use of micro – grid simulation software.

Module 1:

Introduction: Renewable Energy sources and technology, Integration of Renewable energy - need and advantages, Micro-grids basics & its importance for remote locations.


SLE: Decentralized energy distribution & its significance.

Module 2:


SLE: Types of microgrids

Module 3:

Analyzing Case studies of Micro-Grid system: A small 1 kW to 10 kW micro grid systems installed anywhere in the world, Environmental benefits of Micro grid.

SLE: Micro grid & Energy sustainability

10 Hrs

Text Books:


Reference Books:


Assessment Methods:

- Presentation by students will be evaluated for 10 marks and tutorial component test shall be evaluated for 15 marks. Totally 25 Marks.

Mapping of COs to POs & PSOs:

<table>
<thead>
<tr>
<th>COs</th>
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<th>Mapping of COs to PSOs</th>
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</thead>
<tbody>
<tr>
<td>CO1</td>
<td>PO1, PO2, PO6, PO7</td>
<td>PSO2, PSO3</td>
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<tr>
<td>CO2</td>
<td>PO1, PO2, PO3, PO4,</td>
<td>PSO2, PSO3</td>
</tr>
<tr>
<td></td>
<td>PO5, PO7, PO9, PO11</td>
<td></td>
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<tr>
<td>CO3</td>
<td>PO1, PO2, PO3, PO4,</td>
<td>PSO1, PSO2, PSO3, PSO4</td>
</tr>
<tr>
<td></td>
<td>PO5, PO6, PO7, PO8,</td>
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<tr>
<td></td>
<td>PO9</td>
<td></td>
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</tbody>
</table>
ORGANIZATIONAL BEHAVIOUR (2-0-0)2

Sub Code: ME7O08  
Hrs / Week: 02  
SEE Hrs: 2 Hrs  
CIE: 50 %  
SEE: 50 %  
Max. Marks: 50

Course outcomes:
Upon successful completion of this course, the student will be able to:
1. Explain the importance of Organizational Behaviour
2. Analyze using basic principles of Perception and Motivation

Course Content

Module 1: Introduction: Defining OB, Theoretical frameworks (Cognitive, Behaviouristic), Challenges and Opportunities, concept of knowledge management & Emotional Intelligence in contemporary business organization.
SLE: Working with Diversity.  
8 Hrs

Module 2: Perception: Nature and Importance of Perception, Perceptual Selectivity, social perception, attribution  
Attitude: Concept, process, and importance, Attitude measurement. Personality: Concept, nature, types, and theories of personality shaping. Learning: Concept and theories of learning.
SLE: Contributions of Herzberg.  
10 Hrs

SLE: Job Design, Quality of work life and Goal Setting.  
8 Hrs

Text Books:

Reference Books:
1. Understanding Organizational Behavior, by Udai Pareek, Oxford University Press.
Assessment Methods:

1. Written Tests (Test-I, Test-II & Test-III) are Evaluated for 20 Marks each for a total of 40 marks as final CIE.
2. Assignment for 10 marks. Students are required to present a topic highlighted by the faculty.
3. SEE is conducted for 50 marks

Mapping of COs to POs & PSOs:

<table>
<thead>
<tr>
<th>Course Outcomes</th>
<th>Programme Outcomes that are satisfied by the COS</th>
<th>Programme Specific Outcomes satisfied by COs</th>
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</thead>
<tbody>
<tr>
<td>CO 1</td>
<td>PO1, PO2, PO8, PO9, PO10, PO11 &amp; P12</td>
<td>PSO 1</td>
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<tr>
<td>CO2</td>
<td>PO1, PO2, PO8, PO9, PO10, PO11 &amp; P12</td>
<td>PSO 1</td>
</tr>
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</table>
INDUSTRIAL INTERNET OF THINGS (2-0-0)

Sub Code: ME7O09  CIE: 50 %
Hrs / Week: 02  SEE: 50 %
SEE Hrs: 2 Hrs  Max. Marks: 50

Course outcomes:

Upon successful completion of this course, the student will be able to:

1. Understand the concepts of I-IoT and its application to manufacturing sector.
2. Comprehend the various Industrial protocols and importance it.
3. Implement I-IoT application projects.

Course Content

Module 1:


SLE: IoT Frameworks  8 Hrs

Module 2:


SLE: I-IoT edge architecture  9 Hrs

Module 3:

Understanding of I-IoT data loggers: Internal architecture of I-IoT data logger, communication protocols, I/O modules (Digital and Analog).
Configuring I-IoT data logger through a web based application, Establishing communication between PLC and I-IoT data logger. Interfacing of industrial sensor with I-IoT data logger.

Development of cloud based applications for the Mechatronics systems using the I-IoT data logger thorough web portal.

**SLE:** Integration of vision camera with IoT data logger  

**Text Book:**


**Supporting MOOC course:**

1. Introduction to Industry 4.0 and Industrial Internet of Things – NPTEL; https://nptel.ac.in/courses/106/105/106105195/

**Reference Books:**


**Assessment Method:**

- Two tests (Test1 & Test2) will be conducted for 25 Marks. Sum of both the test marks will be considered for CIE calculation.

**Mapping of CO’s to PO’s and PSO’S:**

<table>
<thead>
<tr>
<th>Course Outcomes</th>
<th>Programme Outcomes that are satisfied by the CO’s</th>
<th>Programme Specific Outcomes that are satisfied by the CO’s</th>
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</thead>
<tbody>
<tr>
<td>CO1</td>
<td>PO1, PO2, PO3, PO4 &amp; PO12</td>
<td>PSO1, PSO3 &amp; PSO4</td>
</tr>
<tr>
<td>CO2</td>
<td>PO1, PO2, PO3, PO5, PO9 &amp; PO12</td>
<td>PSO1, PSO3 &amp; PSO4</td>
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<tr>
<td>CO3</td>
<td>PO1, PO2, PO3, PO4, PO5, PO6, PO9 &amp; PO12</td>
<td>PSO1, PSO3 &amp; PSO4</td>
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</table>
INTERNET OF THINGS (2:0:0)

Sub Code: EC7001
Hrs./Week: 02 Hrs
SEE Hrs: 2 Hrs.

CIE: 50% Marks
SEE: 50% Marks
Max. Marks: 50

Course Outcome:
On successful completion of the course, the students will be able to

1. Explain the application, challenges and architecture of IoT.
2. Use sensors and actuators with Controllers
3. Investigate various protocols and wireless technologies.

Module 1: Introduction to Internet of Things

9 Hrs

SLE: M2M

Module 2: Sensors, actuators and IoT Protocols
Parameters for selection of sensors, Proximity sensor, photoelectric sensor, temperature sensor, position sensor, pressure sensor, smart sensor, Linear actuator, circular actuator, Controllers.
Application Protocols – MQTT, REST/HTTP, LORa, CoAP, XMPP, Infrastructure Protocols- Wi-Fi, Bluetooth, Zigbee, RFID.

9 Hrs

SLE: BLE, Z-Wave


8 Hrs

SLE: IOT in healthcare
Text Books:

3. Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6”, Wiley Publisher.

Reference Books:

1. Adrian McEwen, “Designing the Internet of Things”, Wiley Publishers, 2013,
Course Outcomes:
On successful completion of the course, the students will be able to:

1. Summarize on Digital system design.
2. Understanding the concept of programming an embedded system.
3. Identify FPGA architecture, interconnect and technologies.
4. Recognize different FPGAs and implementation methodologies.

Module 1: Revision of Digital systems
Digital system design options and tradeoffs, Number System, Boolean Algebra, Demorgan’s Theorem, Logic Gates, SOP and POS forms, MVP techniques, Combinational circuits: Adders, Mux & Demux, Sequential design: Latches, Flip-Flops, Counters (Synchronous and Asynchronous), state machine design: FSM, Different kinds of programmable logic devices: Field Programmable Gate Array (FPGA), Programmable Logic Device (PLD), FPGA applications. Adjoining devices. Instruments and software.

8 Hrs
SLE: Encoders and Decoders

Module 2: Programming of Embedded systems

8 Hrs
SLE: Lint, Version Control.
Module 3: FPGA Configuration:


Overview of FPGA architectures and technologies

FPGA Architectural options, granularity of function and wiring resources, coarse V/s fine grained, Logic block architecture: FPGA logic cells, timing models, power dissipation I/O block architecture: Input and Output cell characteristics, clock input, Timing, Power dissipation, Programmable interconnect - Partitioning and Placement, Routing resources, delays; Applications - Embedded system design using FPGAs.

10 Hrs

SLE: DSP using FPGAs, Dynamic architecture using FPGAs.

Lab Components: Simulation/implementation exercises of combinational, sequential circuits on Xilinx/Altera boards.

Text Books:


Reference Books:


Power Electronic Devices and Applications (2-0-0)

Sub Code : EE7002
Hrs/Week : 2+0+0
SEE Hrs : 2

CIE: 50% Marks
SEE: 50% Marks
Max. Marks: 50

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

1. Explain the internal structure and working principle of various power electronic devices.
2. Analyze the working of Base drive circuits.
3. Describe the various applications of switching devices.

MODULE 1: Power Semiconductor Devices-I: Introduction, Types of static switches, Ideal and Real switches, power diodes, power bipolar junction transistors and Power MOSFETs, Problems. 09 Hours
SLE: Power Darlington

MODULE 2: Power Semiconductor Devices-II: Insulated Gate Bipolar Transistors (IGBTs), Thyristor (SCR), Problems, Asymmetrical Thyristor, reverse conducting thyristor, Light-Fired Thyristors, Gate Turn Off Thyristor (GTO), TRIAC. 09 Hours
SLE: Two transistor analogy of thyristors

MODULE 3: Applications: SMPS, UPS, Static Switches, Static Circuit Breakers, Solid State Relays. 08 Hours
SLE: Status of development of power switching devices.

Textbooks:

Reference Books:
Course Outcomes

On successful completion of the course, the students will be able to:

1. Identify the need of smart grid and differentiate between smart grid and Intelligrid.
2. Implement the knowledge of smart grid to power system.
3. Discuss various concepts of Dynamic Energy Systems.

MODULE 1: Introduction: Introduction to smart grid, electricity network, local energy networks, electric transportation, low carbon central generation, attributes of the smart grid, alternate views of a smart grid.

SLE: Benefits of Smart Grid.


SLE: Technology Innovation in Electricity use and the Consumer Portal.

MODULE 3: Smart Grid to Evolve a Perfect Power System: Introduction, overview of the perfect power system configurations, device level power system, building integrated power systems, distributed power systems, overview of a dynamic energy management, key characteristics of smart devices.

SLE: Integrated communications architecture.

Textbooks:

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

1. Implement the basic concepts of Agriculture practices.
2. Understand and implement the techniques of precision farming.
3. Implement modern techniques in agriculture practices.

MODULE 1: Introduction to Agriculture: Introduction, scope and its role in crop production, Major field crops of India, farming and cropping systems, soil–plant–water-relationships, water requirement of crops, scheduling irrigation based on various approaches, Tillage, Soil productivity and fertility, Nutrient sources, Control vs prevention of weeds, planting systems and planting densities, Horticultural zones of state and country, Impact of Agriculture in GDP of the nation.  

SLE: Water management of principal crops in India

08 Hours

MODULE 2: Sensors and signal conditioning in Agricultural Engineering: Introduction to sensors, selection criteria for sensors, pH sensor, moisture sensor, humidity sensor, measurement of soil nutrients (NPK), need for signal conditioning.

Geoinformatics and Precision Farming: Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture; Geoinformatics- definition, concepts, tool and techniques; their use in Precision Agriculture. soil mapping; fertilizer recommendation using geospatial technologies; Global positioning system (GPS).

SLE: Spatial data creation and editing in GIS

09 Hours

MODULE 3: Recent Advancements in Agriculture Engineering: Nanotechnology in Agriculture Engineering: brief introduction concepts and techniques, nano-pesticides, nano-fertilizers, nano-sensors, carbon nano tubes for trapping nutrients in soil, use of nanotechnology in seed, water, fertilizer, plant protection for scaling up farm productivity

Computer Vision in Agricultural Engineering: Toxins in Agriculture products, (Aflatoxin), Methods of detection of toxins, Detection of Aflatoxin in Agricultural products by Deep Learning

IoT in Agriculture Engineering: Introduction to IoT, Case Studies – Design of IoT based smart irrigation system, Design of smart agriculture monitoring system using IoT.

SLE: Recent developments in farm machineries in India

09 Hours

Textbooks:
6. Reference Books:
OPEN ELECTIVE
SUPPLY CHAIN MANAGEMENT (2:0:0)

Course Code : IP7001      CIE : 50% Marks
Hrs/Week     : 02         SEE : 50% Marks
SEE Hrs      : 02          Max. Marks: 50

Course Outcomes:

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

1. Understand supply chain concepts, systemic and strategic role of SCM in global competitive environment.
2. Understand the role of logistical and cross functional drivers in the supply chain.
3. Understand the IT framework and E-business supply chains.

Module 1

Introduction to supply chain: Definition of supply chain, supply chain management Supply chain stages and decision phases process view of a supply chain, supply chain flows, competitive and supply chain strategies

SLE: Analyzing the strategies set for successful supply chain. 07Hrs

Module 2
Supply Chain Drivers and Metrics: supply chain performance measure, Supply Chain Decision-Making Framework, role of each driver in creating strategic fit between the supply chain strategy and the competitive strategy.

SLE: expanding the scope of strategic fit. 09Hrs

Module 3
IT and E-business in Supply Chain: Role of IT in a supply chain, the supply chain macro processes, Lack of Supply Chain coordination and the Bullwhip effect, role of E-business in a supply chain, E-business framework, E-business in practice, Understand the importance of sustainability in a supply chain.

SLE: Managerial levers to achieve Coordination 10Hrs
Text Book:


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<td>PO1, PO2, PO3, PO5, PO6, PO7, PO12</td>
</tr>
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</table>
LEAN PRACTICES (2:0:0)

Sub Code : IP7O03  CIE : 50% Marks
Hrs/Week : 02  SEE : 50% Marks
SEE Hrs : 02  Max. Marks: 50

Course Outcomes:

Upon successful completion of this course, the students will be able to:
1. Recognize the underlying philosophy of the Toyota Production System.
2. Analyze the different lean concepts and tool to standardize the operations
3. Explain how to look at one’s own shop floor in terms of lead-time reduction, waste elimination and material flow.

Module 1

Introduction: Mass production system, origin of lean production system, lean revolution in Toyota, basic image of lean production.
Stability of lean system Standards in the lean system, total productive maintenance, standardized work, elements of standardized work, man power reduction, standardized work and kaizen

SLE: Muda (waste) 08Hrs

Module 2

Lean tools: kaizen,5S system, JIT system, Kanban, production leveling, pull systems, job rotation Multi-function workers, poka-yoke (mistake proofing) systems, Jidoka concept, value stream mapping

SLE: why-why analysis, Ishikawa diagram. 10Hrs

Module 3

Shortening of production lead times: Reduction of setup times, concept and techniques, practical procedures for reducing setup time, quality circle activity, Kaizen training, Hoshin planning

SLE: Global enterprises and their benefits 08Hrs
Text books


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</table>

Dept. of Industrial and Production Engineering, Syllabus -IV Year
INTRODUCTION TO PYTHON PROGRAMMING (2:0:0)

Sub Code: CS7O03                        CIE : 50%
Hrs./Week :02                           SEE : 50%
SEE Hours : 02 Hrs.                     Max Marks : 50

Prerequisite:
Basic understanding of computers and programming.

Course Outcomes:
On Successful completion of the Course, the students will be able to:

1. Develop simple Python programs using basic data types, expressions and functions
2. Implement moderately complex python programs that involve branching and looping constructs of Python.
3. Apply file operations for medium scale unstructured text data processing.

MODULE 1:

Introduction to Programming & Python: Why should everyone learn to write programs, Creativity and motivation, Computer hardware architecture, Understanding programming, Terminology: Interpreter and compiler, the building blocks of programs, Variables, expressions, and statements: Values and types, Variable names and keywords, Statements, Operators and operands, Expressions, Order of operations, Modulus operator, String operations, Asking the user for input, Comments.

Functions: Function calls, Built-in functions, Type conversion functions, Math functions, Adding new functions, Parameters and arguments.

SLE: What could possibly go wrong? The types of programming errors. 8 Hours

MODULE 2:

Conditional Execution: Boolean expressions, Logical operators, Conditional execution, Alternative execution, Chained conditionals, Nested conditionals, Catching exceptions using try and except.

Iteration: The while statement, Infinite loops, Finishing iterations with continue, Definite loops using for.

Strings: A string is a sequence, Length of a string, String traversal, String slicing, Looping over strings, The in operator, String comparison, String methods, Format operator.

SLE: Loop patterns, Parsing string 9 Hours
MODULE 3:

Files: Persistence, Opening files, Reading files, Searching through a file, Writing files.


SLE: Lists and strings, Parsing lines, Using try, except, and open with file.

9 Hours TEXT BOOK:


REFERENCE BOOKS:

2. Learning Python, Mark Lutz, O'Reilly; 5th edition

Web Links:

1. Coursera Course: Python for Everybody: https://www.coursera.org/specializations/python
3. Python tutorials: https://realpython.com/
4. Official Python Documentation: https://docs.python.org

** ** ** **
OPEN ELECTIVE
OOP with C++ (2:0:0)

Course Code : IS7001
Hrs/week : 02
SEE Hrs : 02
CIE : 50 Marks
SEE : 50 Marks
Max. Marks: 50

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

1. Apply the concepts of Object-Oriented Programming.
2. Illustrate the usage of Function Overloading, Default Arguments and Operator Overloading.
3. Demonstrate the concept of Inheritance and Polymorphism.

MODULE1: 8Hrs
An Overview of C++:
Self Learning Exercise: Static Class Members.

MODULE2: 9 Hrs
Function Overloading, Copy Constructors, Default Arguments and Operator Overloading Functions: Inline Functions, Friend Functions, Function Overloading, Copy Constructors, Default Function Arguments, Operator Overloading: Creating a Member Operator Function.

MODULE3: 9hrs
Inheritance, Virtual Functions and Polymorphism
Base-Class Access Control, Inheritance and protected Members, Inheriting Multiple Base Classes, Constructors, Destructors, and Inheritance, Virtual Functions, Pure Virtual Functions, Using Virtual Functions.
Self Learning Exercise: Early vs. Late Binding.

TEXTBOOKS:

REFERENCE BOOKS:
OOKS:

MOOC’s:
1. https://www.edx.org/course/introduction-to-c-3

CO-PO Mapping

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<tr>
<th>CO</th>
<th>PO1</th>
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CO-PSO Mapping

<table>
<thead>
<tr>
<th>Course Outcome</th>
<th>PSO-1</th>
<th>PSO-2</th>
<th>PSO-3</th>
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<tbody>
<tr>
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</table>
INTRODUCTION TO CYBER SECURITY (2:0:0)

Course Code : IS7O03
Hrs/week : 02
SEE Hrs : 02
CIE : 50 Marks
SEE : 50 Marks
Max. Marks: 50

Course Outcomes

On Successful completion of the course, the students will be able to:
1. Describe cybercrime, its classifications and various types of Cyber attacks
2. Describe security challenges faced by the mobile devices.
3. Distinguish the different tools and methods used in cybercrime and discuss the impact of Phishing

MODULE 1: 8 Hrs
Introduction to Objectives and cyber offenses
Introduction to cybercrime, Cybercrime and information security, who are Cybercriminals, Classification of Cybercrimes, Cybercrime: The Legal Perspectives, An Indian Perspective, Cybercrime and the Indian ITA 2000,A global perspective on cybercrimes.
Cyber offenses: Introduction, How criminal plan the attacks, Social engineering, Cyber stalking, Cyber cafe and cybercrimes, Botnets: The fuel for cybercrime, Attack vector
Self Learning Exercise: Cloud Computing, Cybercrime era: Survival mantra for the citizens

MODULE 2: 8Hrs
Cyber crime: Mobile and Wireless devices
Introduction, Proliferation of mobile and wireless devices, Trends in mobility, Security challenges posed by mobile devices, Registry setting for mobile devices, authentication service security, Attacks on mobile/ cell phones, Mobile devices: security implications for organizations, Organization measures for handling mobile, Organizational security policies.
Self Learning Exercise: Measures in mobile computing era, Laptops.

MODULE 3: 10Hrs
Tools and method used in Cybercrime:
Introduction, Proxy servers and anonymizers, Phishing, Password cracking Introduction, Proxy servers and anonymizers, Phishing, Password cracking, Key loggers and spywares, Virus and worms, Trojan horses and backdoors, Steganography, DoS and DDoS attacks, SQL injection, Buffer overflow, Phishing and identity theft: Introduction, Phishing
Self Learning Exercise: Attacks on wireless networks, Identity theft (id theft).

TEXT BOOK:
REFERENCEBOOK:

EBOOK:
1 Introduction to computer Networks and cyber security by chwan-Hwa, David Irwin, CRC Press, 2013.

MOOCs:
1 http://www.open.edu/openlearn/futurelearn/cyber-security
2 http://www.cyberdegrees.org/resources/free-online-courses/

<table>
<thead>
<tr>
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<th>PO 1</th>
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</table>
Code: PH7O01  Course: Introduction to Nanotechnology (Open Elective)
Credits: 2  L:T:P:S  2:0:0:0
SEE: 50  CIE: 50
SEE Hours: 2  Max. Marks: 50

<table>
<thead>
<tr>
<th>Prerequisites if any</th>
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</table>
| Learning objectives  | 1. To provide a comprehensive overview of synthesis and characterization of nanoparticles, nanocomposites and hierarchical materials with nanoscale features.  
2. To provide the engineering students with necessary background for understanding various nanomaterials characterization techniques  
3. To develop an understanding of the basis of the choice of material for device applications  
4. To give an insight into complete systems where nanotechnology can be used to improve our everyday life |

Course Outcomes:

*On the successful completion of the course, the student will be able to*

<table>
<thead>
<tr>
<th>COs</th>
<th>Course Outcomes</th>
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<tbody>
<tr>
<td>CO1</td>
<td>Demonstrate the synthesis of nanoparticles by various techniques. [L2]</td>
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<tr>
<td>CO2</td>
<td>Explain working of basic instruments used in characterization of nanoparticles. [L2]</td>
</tr>
<tr>
<td>CO3</td>
<td>Discuss the application of nanotechnology to mechanical and civil domains [L2]</td>
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<tr>
<td>CO4</td>
<td>Classify the nanomaterials based on the dimensions. [L3]</td>
</tr>
<tr>
<td>CO5</td>
<td>Assess the suitability of nanomaterials for various device applications. [L4]</td>
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</table>

Mapping with POs and PSOs:

<table>
<thead>
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<th>COs</th>
<th>POs</th>
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<td>CO4</td>
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<tr>
<td>CO5</td>
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</table>

Mapping Strength: Strong – 3  Medium – 2  Low – 1

Teaching - Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching – Learning more effective

1. Chalk and Talk
2. Powerpoint presentation
3. Video Lecturing
4. E-sources
5. Self learning
## Course Structure

### Module-1 (09 hours of pedagogy)

**Introduction to Nanomaterials**

Classification of Nanomaterials, Variation of physical properties from bulk to thin films to nanomaterials, Synthesis of Nanomaterials: Bottom-Up approach: Chemical Routes for Synthesis of nanomaterials - Physical vapor deposition. Top-Down approach - Ball milling technique, Nanolithography, Graphene, SWCNT, MWCNT, Fullerenes and other Carbon Materials: Carbon nanocomposites, nanofibres, nanodiscs, nanodiamonds and their Applications.

### Module-2 (08 hours of pedagogy)

**Characterization of Nanomaterials**


### Module-3 (09 hours of pedagogy)

**Applications of Nanotechnology**


---

**Suggested Learning Resources:**

**Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)**

3. Nano Essentials- T. Pradeep/TMH
Reference Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)
1. Introduction to Nanotechnology, C. P. Poole and F. J. Owens, Wiley, 2003
2. Understanding Nanotechnology, Scientific American 2002

Web links and Video Lectures (e-Resources):

<table>
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<th>Web links</th>
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<tr>
<td><a href="https://nptel.ac.in/courses/118104008">https://nptel.ac.in/courses/118104008</a></td>
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<td><a href="https://nptel.ac.in/courses/112107283">https://nptel.ac.in/courses/112107283</a></td>
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<tr>
<td><a href="https://onlinecourses.nptel.ac.in/noc22_me131/preview">https://onlinecourses.nptel.ac.in/noc22_me131/preview</a></td>
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</tbody>
</table>

***
Quantum Computing (2:0:0)

Sub Code: PH7O02
Hrs/ Week : 02
SEE Hrs. : 02
Credits : 2 (26 hrs)

CIE: 50%
SEE: 50%
Max Marks : 50

Course Outcome:
On successful completion of the course, the students will be able to,

1. Learn about quantum teleportation, quantum computing, quantum error correction.
2. Master the modern mathematical apparatus of quantum logic algorithms and protocols for transmitting and processing quantum information and learn how to solve problems on these topics.

Module I: Statistical aspects of quantum mechanics
Qubit. Physical implementations of qubit, Qubit as a quantum unit of information. The Bloch sphere, Pure and mixed states of quantum systems, Density matrix and its properties, Qubit systems. Inseparability of quantum systems, Reduced density matrix.

8hrs

Module II: Quantum mechanics

9hrs

Module III: Quantum gates and algorithms

9hrs

References:
Course Code: CH7O01  
Course: Nanocomposites for Engineering Applications

Credits: 2  
L: T:P:S 1:0:2:0

SEE: 50 Marks  
CIE: 50 Marks

SEE Hours: 2 Hrs  
Max. Marks: 100

Prerequisites if any: None

Learning objectives:
1. Students will understand and appreciate the significance of the nanocomposites as an important class of materials
2. Students will be well equipped to design and develop nanocomposites for specialized applications
3. They will be able to predict the appropriate synthesis and application for different classes of nanocomposites.

Course Outcomes:

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

<table>
<thead>
<tr>
<th>Course Outcomes</th>
<th>Bloom’s level</th>
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<tbody>
<tr>
<td>CO1 To provide knowledge of the advantages of using different types of nanocomposites</td>
<td>Remember Understand</td>
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<tr>
<td>CO2 To impart knowledge about the fabrication and testing methods of different nanocomposites.</td>
<td>Remember Understand</td>
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<tr>
<td>CO3 To make understand the students with the underlying properties of nanocomposites for harnessing their unique properties for novel applications.</td>
<td>Remember Understand</td>
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Mapping with POs and PSOs:

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Strong: 3  
Medium: 2  
Low: 1

Course Content

| Module – 1  
Nanocomposites | No. of Lecture Hours | No. of Practical Hours | Self Learning Hours |
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<tr>
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<tbody>
<tr>
<td>1.1 Introduction to composite materials, Definition of composites, Classification of composites; Polymer- nanomaterial composites and applications.</td>
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<tr>
<td>1.2 Basic Constituents materials in Nanocomposites, properties of nanocomposite materials, Nano particle dispersion in polymer matrix,</td>
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<tr>
<td>1.3 Specialty composites: nano-biocomposites, bio-mimetic nanocomposites and biologically inspired nanocomposites,</td>
<td>2</td>
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<tr>
<td>1.4 nanocomposites for hard coatings, Corrosion prevention, Composites for sensors, opto-electronic applications</td>
<td>2</td>
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</table>

| Module – 2  
Fabrication and Characterization Techniques | No. of Lecture Hours | No. of Practical Hours | Self Learning Hours |
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<tbody>
<tr>
<td>2.1 Nanocomposite Fabrication Methods: Nanocomposite processing: In-situ polymerization technique, Solution casting, Electro spinning, Melt mixing, Filament Winding, Injection and compression molding, Vacuum bag moulding Method, Pultrusion Process</td>
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<td>2.2 Characterization - Microscopic techniques for characterization- Scanning Electron, Transmission Electron, Atomic Force</td>
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Microscopy. Spectroscopic- Optical, elemental, structural and Diffraction techniques for characterization.

### Practical

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<tr>
<td>3.1</td>
<td>Synthesis of nanomaterials</td>
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<tr>
<td>3.2</td>
<td>Synthesis of biodegradable polymer-based nanocomposites</td>
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<tr>
<td>3.3</td>
<td>Synthesis of synthetic polymer-based nanocomposites</td>
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<tr>
<td>3.4</td>
<td>Analyzing the XRD spectrum of given nanocomposite</td>
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<tr>
<td>3.5</td>
<td>Evaluating the FT-IR spectrum of given nanocomposite</td>
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<tr>
<td>3.6</td>
<td>Evaluating optical properties of prepared nanocomposite using UV-ViS spectrometer</td>
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<tr>
<td>3.7</td>
<td>Determining the particle size and surface properties using the SEM, AFM</td>
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<td>3.8</td>
<td>Elemental analysis of the sample using EDAX</td>
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<tr>
<td>3.9</td>
<td>Performance evaluation of prepared nanocomposites for different application (2labs)</td>
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<tr>
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<td>Total No. of Self learning Hours</td>
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Note: Maximum intake for the course is 20 students
On successful completion of the course the students will be able to:

1. Find the complete solution to the system of equations and compute the dimension of four fundamental subspaces.
2. Diagonalize the given matrix and discuss Singular value decomposition.

**Module I:**
Vector spaces, Subspaces; Null space, Gaussian elimination, Solving $Ax=0$, the complete solution to $Ax=b$, Independence, Span, Basis and Dimension, four fundamental subspaces.

(SLE: Coordinate vectors)

10 Hrs

**Module II:**
Linear Transformations, The Matrix of Linear Transformations, Orthogonality of the four fundamental subspaces, Fundamental theorem of Linear Algebra, Orthonormal Bases, Projections, Gram-Schmidt Method.

(SLE: least square problems)

8 Hrs

**Module III:**
Eigen values and Eigenvectors, Similarity transformations, symmetric matrix, Jacobi's method for diagonalization of symmetric matrices. Singular value decomposition.

(SLE: Properties of Eigen value & Eigenvectors)

8 Hrs

**Textbook:**

**References:**
1. Vittal Rao video lectures URL:

https://www.youtube.com/watch?v=NAa eQQh2s&list=PL05CD03A43AE66

2. Gilbert Strang video lectures URL:

https://www.youtube.com/watch?v=ZK30402wf1c&list=PL49CF3175CB9EF31D&index=1