# UNIVERSITY POLYTECHNIC
# BIRLA INSTITUTE OF TECHNOLOGY MESRA – 835215 (RANCHI)
## DEPARTMENT OF COMPUTER ENGINEERING

NEW COURSE STRUCTURE – To be effective for Diploma 2023-24
Based on CBCS system & OBE model
Recommended scheme of study for
**Diploma in Computer Engineering**

| Semester of Study | Category of course | Course Code | Subjects | Mode of delivery | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | C |
| | | | **THEORY** | | | | |
| FIFTH | Program Core | DCE 501 | Java Programming | 4 | 0 | 0 | 4 |
| | Program Elective | PE-I: DPE 521/ DPE 522/ DPE 523 | | 3 | 0 | 0 | 3 |
| | | PE-II: DPE 524/ DPE 525/ DPE 526 | | 3 | 0 | 0 | 3 |
| | Open Elective | OE-II: DOE 521/ DOE 522/ DOE 523 | | 3 | 0 | 0 | 3 |
| | | | **SESSIONAL** | | | | |
| | Program Core | DCE 502 | Java Programming Lab | 0 | 0 | 2 | 1 |
| | | DCE 504 | Multimedia Technology Lab | 0 | 0 | 2 | 1 |
| | Major Project | DPR 521 | Major Project | 0 | 0 | 4 | 2 |
| | Summer Internship | DSI 521 | Summer Internship | 0 | 0 | 0 | 4 |
| **TOTAL CREDITS** | | | | | | | 21 |
| **Total Lectures Per Week** | | | | | | | |

| Semester of Study | Category of course | Course Code | Subjects | Mode of delivery | | | Credits |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | C |
| SIXTH | | | **THEORY** | | | | |
| | Program Core | DCE601 | Computer Hardware | 3 | 0 | 0 | 3 |
| | Program Elective | PE-III: DPE 621/ DPE 622/ DPE 623 | | 3 | 0 | 0 | 3 |
| | | PE-IV: DPE 624/ DPE 625/ DPE 626 | | 3 | 0 | 0 | 3 |
| | Humanities and Social Sc. | DHS 601 | Entrepreneurship and Start-ups | 3 | 1 | 0 | 4 |
| | Open Elective | OE-III: DOE 621/ DOE 622/ DOE 623 | | 3 | 0 | 0 | 3 |
| | Mandatory Course | DAU 601 | Indian Constitution | 2 | 0 | 0 | 0 |
| | | | **SESSIONAL** | | | | |
| | Program Core | DCE 602 | Computer Hardware lab | 0 | 0 | 2 | 1 |
| | Program Core | DCE 604 | IOT lab | 0 | 0 | 2 | 1 |
| | Seminar | DSE621 | Seminar | 0 | 0 | 2 | 1 |
| | Major Project | DPR621 | Project | 0 | 0 | 4 | 2 |
| | **TOTAL CREDITS** | | | **17** | **1** | **10** | **21** |
| | **Total Lectures Per Week** | | | | | | |
| | **GRAND TOTAL FOR THIRD YEAR** | | | | | | |

(RAMNISH SINHA)
Abhay Kumar
(ABHAY KUMAR)

Ronakte
Trivedi

# UNIVERSITY POLYTECHNIC
# BIRLA INSTITUTE OF TECHNOLOGY MESRA – 835215 (RANCHI)
## DEPARTMENT OF COMPUTER ENGINEERING

### PROGRAMME ELECTIVES (PE)

| SEMESTER | Code no. | Name of the PE courses | Prerequisite/ Co-requisite courses | L | T | P | C |
|---|---|---|---|---|---|---|---|
| **PE-I** | | | | | | | |
| **SEM-V** | DPE521 | Computer Graphics | | 3 | 0 | 0 | 3 |
| | DPE522 | Introduction to Cloud Computing | | 3 | 0 | 0 | 3 |
| | DPE523 | Object-oriented programming in C++ | | 3 | 0 | 0 | 3 |
| **PE-II** | | | | | | | |
| **SEM- V** | DPE524 | Introduction to Computer Algorithms | | 3 | 0 | 0 | 3 |
| | DPE525 | Data Science | | 3 | 0 | 0 | 3 |
| | DPE526 | Multimedia and Animation | | 3 | 0 | 0 | 3 |
| **PE-III** | | | | | | | |
| **SEM- VI** | DPE621 | Foundations of AI/ML | | 3 | 0 | 0 | 3 |
| | DPE622 | Operations Research | | 3 | 0 | 0 | 3 |
| | DPE623 | Cyber Security | | 3 | 0 | 0 | |
| **PE-IV** | | | | | | | |
| **SEM- VI** | DPE624 | Internet of Things | | 3 | 0 | 0 | 3 |
| | DPE625 | Machine Learning | | 3 | 0 | 0 | 3 |
| | DPE626 | Computer Oriented Numerical and Statistical Methods | | 3 | 0 | 0 | 3 |

(RAMNISH SINHA)

# UNIVERSITY POLYTECHNIC
# BIRLA INSTITUTE OF TECHNOLOGY MESRA – 835215 (RANCHI)
## DEPARTMENT OF COMPUTER ENGINEERING

### OPEN ELECTIVES (OE)*

| SEMESTER | Code no. | Name of the PE courses | Prerequisite/ Co-requisite courses with code | L | T | P | C |
|---|---|---|---|---|---|---|---|
| **OE-I** | | | | | | | |
| **SEM-IV** | DOE421 | C Programming Language | | 3 | 0 | 0 | 3 |
| | DOE422 | Introduction to Python | | 3 | 0 | 0 | 3 |
| | DOE423 | Data Base Concepts | | 3 | 0 | 0 | 3 |
| **OE-II** | | | | | | | |
| **SEM- V** | DOE521 | Web Programming Concepts | | 3 | 0 | 0 | 3 |
| | DOE522 | Data Structures in C | | 3 | 0 | 0 | 3 |
| | DOE523 | PC Maintenance & Networking | | 3 | 0 | 0 | 3 |
| **OE-III** | | | | | | | |
| **SEM- VI** | DOE621 | Intro. to Computer Graphics | | 3 | 0 | 0 | 3 |
| | DOE622 | Intro. to Machine Learning | | 3 | 0 | 0 | 3 |
| | DOE623 | Introduction to Multimedia | | 3 | 0 | 0 | 3 |
| *OPEN ELECTIVES TO BE OPTED ONLY BY OTHER DEPARTMENT STUDENTS | | | | | | | |

# UNIVERSITY POLYTECHNIC
# BIRLA INSTITUTE OF TECHNOLOGY MESRA – 835215 (RANCHI)
## DEPARTMENT OF COMPUTER ENGINEERING

### DCE601 COMPUTER HARDWARE

| PROGRAMME: Diploma in Computer Engineering | | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE CODE: **DCE 601** | | | COURSE TITLE: **COMPUTER HARDWARE** | | | | |
| COMPULSORY: Program Core | | | | | | | |
| Teaching Scheme and Credits | | | | | EXAMINATION SCHEME | | |
| L | T | P | HRS/WK | CREDIT | PE | FINAL | TOTAL |
| 3 | 0 | 0 | 3 | 3 | 50 | 50 | 100 |

**RATIONALE:**

1. Provides core knowledge of computer hardware essential for roles in IT support, system maintenance, and hardware design.
2. Equips students to identify, analyze, and resolve real-world hardware issues effectively.
3. Covers up-to-date technologies like modern microprocessors, memory systems, and power supplies used in today's computing.
4. Builds a strong base for learning advanced subjects such as computer architecture and networking.
5. Promotes preventive maintenance, virus protection, and logical troubleshooting to ensure long-term system stability.

**COURSE OUTCOMES:**

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

1. Identify motherboard form factors, layout, and components to effectively analyze and troubleshoot hardware issues.
2. Understand and evaluate microprocessor technologies, including modern advancements.
3. Explore memory packaging, configurations, and storage devices like DRAM, HDDs, CDs, and DVDs.
4. Analyze power issues and understand the design and function of SMPS and UPS systems.
5. Understand printer operations, apply preventive maintenance, detect viruses, and perform logical PC troubleshooting.

**COURSE CONTENT:**

| Module | Topics/Subtopics |
|---|---|
| 1. | **Motherboard**<br>1.1 Motherboard form factors;<br>1.2 Layout of motherboard;<br>1.3 Components of motherboard — chipset, processor socket, expansion slots,<br>1.4 Components of motherboard —Power supply connectors, ROM BIOS, CMOS, ports etc.<br>Course Outcome: CO1 Teaching Hours: 6 hrs |
| 2. | **Microprocessor**<br>2.1 Processor Specification, FSB;<br>2.2 Evolution of Processor;<br>2.3 Modern Microprocessor technology- 64 bit architecture, Hyper-Threading, Multi-core processor, Turbo boost, Smart cache.<br>2.4 Super scaler, super pipelining, VLIW<br>Course Outcome: CO2 Teaching Hours: 6 hrs |
| 3. | **Memory**<br>3.1 Memory Physical Packaging;<br>3.2 SIMM, DIMM & RIMM memory modules;<br>3.3 Memory Banks;<br>3.4 Types of DRAM— FPM, EDO, BEDO, SDRAM, RD RAM, DDR.<br>3.5 Hard Drives<br>3.6 CD & DVD.<br>Course Outcome: CO3 Teaching Hours: 6 hrs |
| 4. | **Power Supply**<br>4.1 Power Problems— Spike, Surge, Brownout and Blackout; EMI (Electromagnetic Interference); ESD;<br>4.2 SMPS— SMPS form factors, connectors and voltages;<br>4.3 UPS— Purpose of UPS, SPS and Double conversion UPS.<br>4.4 Comparison of SPS vs Double concersion UPS.<br>Course Outcome: CO4 Teaching Hours: 6 hrs |
| 5. | **Printer, Preventive Maintenance & Troubleshooting**<br>5.1 Printer: Working of Dot matrix printer, Inkjet printer and Laser printer;<br>5.2 Maintenance and Troubleshooting: Preventive Maintenance — HDD, CDROM, Viruses detection and Protection;<br>5.3 Steps of Logical Troubleshooting, common PC problems.<br>5.4 Common PC issues- No display, No sound, continuous rebooting of system, slow performance of PC.<br>Course Outcome: CO5 Teaching Hours: 6 hrs |

**TEXT BOOKS:**

| S. N. | Title | Author, Publisher, Edition and Year of publication | ISBN |
|---|---|---|---|
| 1. | "PC Hardware: A Beginner's Guide" | Ron Gilster, TMH | 9780070447363 |

**REFERENCE BOOKS:**

| S. N. | Title | Author, Publisher, Edition and Year of publication | ISBN |
|---|---|---|---|
| 2. | "The Complete Computer Repair Textbook" | C.A.Schmidt, 3e, Dreamtech | 9781576760338 |
| 3. | "A+ Complete Study Guide" | David Groth, 3e, Sybex Inc | 9780782142433 |

**E-REFERENCES:**

https://web.stanford.edu/class/cs101/hardware-1.html

**CO VS PO MAPPING:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 3 | 3 |

**SIGNATURES:**

**UNIVERSITY POLYTECHNIC**
**BIRLA INSTITUTE OF TECHNOLOGY MESRA – 835215 (RANCHI)**

**DEPARTMENT OF COMPUTER ENGINEERING**

# COMPUTER HARDWARE LAB.

| PROGRAMME: Diploma in Computer Engineering | | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE CODE: **DCE 602** | | | COURSE TITLE: **COMPUTER HARDWARE LAB.** | | | | |
| COMPULSORY: Program Core | | | | | | | |
| Teaching Scheme and Credits | | | | | EXAMINATION SCHEME | | |
| L | T | P | HRS/WK | CREDIT | PE | FINAL | TOTAL |
| 0 | 0 | 2 | 2 | 1 | 50 | 50 | 100 |

RATIONALE:

1. Covers motherboard form factors (XT, AT, LPX, ATX) for hardware compatibility and performance.
2. Teaches PC assembly/disassembly and core component installation for hardware maintenance careers.
3. Introduces non-destructive fault-finding to maintain system integrity in IT support.
4. Develops skills in BIOS setup, OS installation, driver, and disk management for system administration.
5. Covers preventive maintenance and basic troubleshooting using diagnostic tools to ensure system performance.

COURSE OUTCOMES:

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

1. Identify and compare motherboard form factors (XT, AT, LPX, ATX) for hardware compatibility and performance.
2. Assemble and disassemble PCs, including installing and configuring key components.
3. Perform non-destructive fault finding on ports, power supplies, and storage devices.
4. Configure BIOS, install/repair OS, manage drivers and disks for system administration.
5. Use maintenance tools and diagnostic cards to troubleshoot and ensure system reliability.

## COURSE CONTENT DETAILS:

| Module | Topics/Subtopics |
|---|---|
| 1. | **Motherboard**<br>1.1 Identification of motherboard components- XT form factor<br>1.2 Identification of motherboard components- AT form factor<br>1.3 Identification of motherboard components- LPX form factor<br>1.4 Identification of motherboard components- ATX form factor<br>Course Outcome: CO1 Teaching Hours: 4 hrs |
| 2. | **Disassembling &Assembling of PC**<br>2.1 Installation of Motherboard<br>2.2 Installation of Processor<br>2.3 Installation of RAM<br>2.4Installation of Hard disk, CD/DVD<br>2.5 Connecting Power supply<br>2.6 Installing Expansion cards<br>Course Outcome: CO2 Teaching Hours: 4 hrs |
| 3. | **Non-destructive fault finding**<br>3.1 Non-destructive fault finding- VGA Port<br>3.2 understanding the relationship between colour and voltage -VGA Port<br>3.3 Non-destructive fault finding- USB Port, PS2 Port, Audio Port, HDD, DVD<br>3.4 SMPS - Testing of SMPS using Multimeter<br>3.5 SMPS - Testing of SMPS using SMPS tester<br>3.6 Non- destructive fault finding(+5 V, +3.3 V, +12 V, PS ON, VRM, PG)<br><br>Course Outcome: CO3 Teaching Hours: 4 hrs |
| 4. | **OS Installation, configuration, Disk Manangement**<br>4.1 BIOS configuration<br>4.2 Installation of Operating system<br>a. Fresh installation<br>b. Repairing corrupted operating system.<br>4.3 Installation of display diver, sound driver, network driver.<br>4.4 Managing disk and file system:<br>a. Installing two hard disk<br>b. Creating primary, extended, logical partition<br>c. Formatting a partition<br>4.5 Managing disk and file system:<br>d. Converting a Basic Disk to a Dynamic Disk<br>e. Understanding simple, spanned, striped, Mirrored volume<br>i. Creating Simple, spanned, striped volume<br>ii. Extending volume size<br>iii. Deleting simple, striped, spanned volume<br>Course Outcome: CO4 Teaching Hours: 4 hrs |

| | |
|---|---|
| 5. | **Preventive Maintenance & Troubleshooting**<br>5.1 Preventive maintenance tools:System restore<br>I. Creating restore point<br>II. Restore system to earlier date and time.<br>5.2 Preventive maintenance tools:Disk defragmentation<br>5.3 Preventive maintenance tools:Scandisk<br>5.4 Installation and configuration of Anti-virus<br>5.5 Troubleshooting PC basic problems<br>5.6 Troubleshooting using diagnostic card<br>Course Outcome: CO5 Teaching Hours: 4 hrs |

**REFERENCE BOOKS:**

| S. N. | Title | Author, Publisher, Edition and Year of publication | ISBN |
|---|---|---|---|
| 1. | "PC Hardware: A Beginner's Guide" | Ron Gilster,TMH | 9780070447363 |
| 2. | "The Complete Computer Repair Textbook" | C.A.Schmidt, 3e, Dreamtech | 9781576760338 |
| 3. | "A+ Complete Study Guide" | David Groth, 3e, Sybex Inc | 9780782142433 |

**CO VS PO MAPPING:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 3 | 3 |

**SIGNATURES:**

**UNIVERSITY POLYTECHNIC**
**BIRLA INSTITUTE OF TECHNOLOGY MESRA – 835215 (RANCHI)**

**DEPARTMENT OF COMPUTER ENGINEERING**

# INTERNET OF THINGS LAB

| PROGRAMME: Diploma in Computer Engineering | | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE CODE: **DCE 604** | | | COURSE TITLE: **INTERNET OF THINGS LAB** | | | | |
| COMPULSORY: Program Core | | | | | | | |
| Teaching Scheme and Credits | | | | | EXAMINATION SCHEME | | |
| L | T | P | HRS/WK | CREDIT | PE | FINAL | TOTAL |
| 0 | 0 | 2 | 2 | 1 | 50 | 50 | 100 |

RATIONALE:

1. Learn Arduino basics through LED projects, building foundational skills in electronics and microcontroller programming.
2. Control devices wirelessly using Arduino and Bluetooth, gaining hands-on experience with smart system design.
3. Use WiFi and mobile apps to build networked systems, advancing skills in IoT and smart device development.
4. Integrate sensors with Arduino to collect data, supporting automation and environmental monitoring projects.
5. Get introduced to Raspberry Pi and its applications, enhancing abilities in hardware-software integration.

COURSE OUTCOME:

1. Use Arduino Uno for basic electronics projects, building skills in microcontroller programming and circuit design.
2. Implement wireless control systems using Arduino and Bluetooth technology.
3. Create WiFi-connected devices and mobile apps for IoT and smart device applications.
4. Integrate sensors with Arduino for data collection and automated control.
5. Develop electronics projects using Raspberry Pi, from simple to advanced applications.

COURSE CONTENT DETAILS:

| Module | Topics/Subtopics |
|---|---|
| 1. | **Arduino Uno Board: An Overview**<br>1.1 Overview of Arduino Uno board<br>1.2 Develop project to Turn ON/OFF LED<br>1.3 Develop project to Fade LED<br><br>Course Outcome: CO1 Teaching Hours: 4 hrs |
| 2. | **Mini projects based on Arduino Uno Board - Bluetooth module**<br>2.1 Overview of Relay Module<br>2.2 Develop project to Turn ON/OFF Bulb<br>2.3 Overview of Bluetooth module<br>2.4 Develop project for Controlling devices through Bluetooth<br><br>Course Outcome: CO2 Teaching Hours: 4 hrs |
| 3. | **Mini projects based on Arduino Uno Board - Wfi module, App development**<br>3.1 Overview of Wifi module<br>3.2 Develop project for Controlling devices through Wifi<br>3.3 Overview of App Development<br>3.4 App Development for controlling devices using wifi<br><br>Course Outcome: CO3 Teaching Hours: 4 hrs |
| 4. | **Mini Project based on sensors**<br>4.1 Overveiw of soil humidity sensor<br>4.2 Develop project for reading data from soil humidity sensor<br>4.3 Overveiw of ultrasonic sensor<br>4.4 Develop project for Controlling devices using ultrasonic sensor<br>4.5 Develop project for Controlling devices using light sensor<br><br>Course Outcome: CO4 Teaching Hours: 4 hrs |
| 5. | **Raspberry pi**<br>**5.1** Overview of Raspberry pi<br>**5.2** Develop project for Blinking LED<br>**5.3** Develop project for Temperature Monitoring System<br><br>Course Outcome: CO5 Teaching Hours: 6 hrs |

**E-REFERENCES:**

https://create.arduino.cc/projecthub
https://www.arduino.cc/reference/en/
https://iot.arduino.cc/

**REFERENCE BOOKS:**

| S. N. | Title | Author, Publisher, Edition and Year of publication | ISBN |
|---|---|---|---|
| 1. | "Designing the Internet of Things" | McEwen, Adrian, and Hakim Cassimally, John Wiley & Sons, Incorporated, 2013. | 111843062X, 978-1118430620 |
| 2. | "Internet of Things: A Hands-On Approach" | Arsheep Bahga &Vijay Madisetti, Universities Press – 2015 | 0996025510, 9780996025515 |

**CO VS PO MAPPING:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

**SIGNATURES:**

## UNIVERSITY POLYTECHNIC

## BIRLA INSTITUTE OF TECHNOLOGY MESRA – 835215 (RANCHI)

## DEPARTMENT OF COMPUTER ENGINEERING

## COURSE:FOUNDATIONS OF AI/ML

| PROGRAMME: DIPLOMA IN COMPUTER ENGINEERING | | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE CODE:**DPE 621** | | | COURSE TITLE: **FOUNDATIONS OF AI/ML** | | | | |
| COMPULSARY / ELECTIVE: **ELECTIVE** | | | | | | | |
| Teaching Scheme and Credits | | | | | EXAMINATION SCHEME | | |
| L | T | P | HOURS/WEEK | CREDIT | PE | FINAL | TOTAL |
| 3 | 0 | 0 | 3 | 3 | Q-20, TA-5, MID-25 | 50 | 100 |

RATIONALE:

1. Strengthens Python fundamentals and introduces NumPy for efficient numerical computing and data manipulation.
2. Provides mathematical foundation through matrix operations, vector spaces, and decomposition techniques essential for scientific computing.
3. Introduces essential Python libraries like SciPy, Pandas, and Matplotlib to solve, handle, and visualize real-world data effectively.
4. Covers core concepts of differentiation for multivariate functions, vital for optimization and machine learning applications.
5. Builds statistical understanding using probability models and hypothesis testing, supporting data analysis and inference.

COURSE OUTCOME (CO)

1. Students will be able to apply Python programming fundamentals and perform basic array and matrix operations using NumPy.
2. Students will be able to understand and apply concepts of linear algebra including matrix operations, vector spaces, and eigenvalue analysis in computing.
3. Students will be able to use Python libraries like SciPy, Pandas, and Matplotlib for solving linear systems, data handling, and visualization.
4. Students will be able to perform partial differentiation and compute gradients of vector-valued functions for analytical and optimization tasks.
5. Students will be able to apply probability distributions and hypothesis testing methods to analyze and interpret data statistically.

## COURSE CONTENT

| MODULES WITH TOPICS |
|---|
| **1. MODULE-I Revision of Python Basics**<br>1.1. **Basic Python**: Revision of basic data types, operators and expressions. Basic Mathematical and Logical Operations in Python.<br>1.2. Handling Inbuild containers: Lists, Tuples, sets and Dictionaries.<br>1.3. The NumPy Library: N-D Array, Matrices, and Array Operations.<br>Course Outcome: CO1 Teaching Hours: 6 hrs |
| **2. MODULE-II Introduction to Vectors Space and Matrices**<br>2.1. Review of Matrix Operations, Solution of systems of linear equations, matrices, solving systems of linear equations.<br>2.2. Vector Space, Linear Independence, and Basis.<br>2.3. Determinant and Trace, Eigenvalues and Eigenvectors, Cholesky decomposition.<br>Course Outcome: CO1 Teaching Hours: 9 hrs |
| 3. **MODULE-III Scientific Python Libraries**<br>3.1. Introduction to SciPy Library, solving linear systems using SciPy library functions.<br>3.2. Matplotlib: Exploration of Data using Visualization: Bar Chart, Histogram, Distribution or Density Plot, Box Plot, Scatter Plot.<br>3.3. Sequence and Data Frames, Data handling using Pandas.<br>*Course Outcome: CO3 Teaching Hours: 6 hrs* |
| **4. MODULE-IV Partial and Vector Differentiation**<br>**4.1.** Revision on Differentiation of Univariate functions,<br>**4.2.** Partial differentiation,<br>**4.3.** Gradients of vector-valued functions.<br>*Course Outcome: CO2 Teaching Hours: 6 hrs* |
| **5. MODULE-V Probability Distributions and Hypothesis Testing**<br>5.1. Binomial Distribution, Poisson Distribution, Normal (Gaussian) distribution<br>5.2. Testing of Hypothesis<br>5.2.1. Mean based<br>5.2.2. Proportions related<br>5.3. Maximum Likelihood<br>*Course Outcome: CO4 Teaching Hours: 6 hrs* |

**TEXT BOOKS**

| S. N. | Title | Author, Publisher, Edition, and Year of publication | ISBN/Source |
|---|---|---|---|
| 1. | Scientific Python Lectures | Gaël Varoquaux<br>Emmanuelle Gouillart<br>Olaf Vahtras<br>Pierre de Buyl<br>K. Jarrod Millman<br>Stéfan van der Walt.<br>*Creative Commons* | lectures.scientific-python.org |
| 2. | SciPy Programming Succinctly | James McCaffrey,<br>Syncfusion, Inc. | |
| 3. | Mathematics for Machine Learning | by Marc Peter Deisenroth, A. Aldo Faisal, et.al., Cambridge University Press (2020), | ISBN-10 : 110845514X<br>ISBN-13 : 978-1108455145 |
| 4. | Practical Mathematics for AI and Deep Learning. | by Tamoghna Ghosh and Shravan Kumar Belagal, BPB Publications (2022) | ISBN-10 : 9355511930<br>ISBN-13 : 978-9355511935 |

**REFERENCE BOOKS**

| **S. N.** | **Title** | **Author, Publisher, Edition, and Year of publication** | **ISBN/Source** |
|---|---|---|---|
| 1. | **Scientific Python Lectures** | Gaël Varoquaux<br>Emmanuelle Gouillart<br>Olaf Vahtras<br>Pierre de Buyl<br>K. Jarrod Millman<br>Stéfan van der Walt.<br>*Creative Commons* | **lectures.scientific-python.org** |
| 2. | **SciPy Programming Succinctly** | James McCaffrey, Syncfusion, Inc. | |
| 3. | **Mathematics for Machine Learning** | by Marc Peter Deisenroth, A. Aldo Faisal, et.al., Cambridge University Press (2020), | **ISBN-10 : 110845514X**<br>**ISBN-13 : 978-1108455145** |
| 4. | **Practical Mathematics for AI and Deep Learning.** | by Tamoghna Ghosh and Shravan Kumar Belagal, BPB Publications (2022) | **ISBN-10 : 9355511930**<br>**ISBN-13 : 978-9355511935** |

**E-REFERENCE**

**1. https://www.aspiration.ai/mlbook.**

CO-PO MAPPING

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 2 | 2 | 1 | 3 | 3 |
| CO2 | 3 | 1 | 2 | 2 | 1 | 3 | 3 |
| CO3 | 3 | 2 | 2 | 2 | 1 | 3 | 3 |
| CO4 | 3 | 2 | 2 | 2 | 1 | 3 | 3 |
| CO5 | 3 | 2 | 2 | 2 | 1 | 3 | 3 |

SIGNATURES:

**UNIVERSITY POLYTECHNIC**

**BIRLA INSTITUTE OF TECHNOLOGY MESRA – 835215 (RANCHI)**

**DEPARTMENT OF COMPUTER ENGINEERING**

# DPE 622 OPERATIONS RESEARCH

| PROGRAMME: Diploma in Computer Engineering | | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE CODE: **DPE 622** | | | COURSE TITLE: **OPERATIONS RESEARCH** | | | | |
| COMPULSORY: Program Elective | | | | | | | |
| Teaching Scheme and Credits | | | | | EXAMINATION SCHEME | | |
| L | T | P | HRS/WK | CREDIT | PE | FINAL | TOTAL |
| 3 | 0 | 0 | 3 | 3 | 50 | 50 | 100 |

## RATIONALE:

1. Introduces the foundational mathematical tools and modeling techniques essential for solving real-world optimization problems in OR.
2. Develops problem-solving skills through LPP formulations and optimization techniques like the graphical method and simplex algorithm.
3. Trains students in efficient resource allocation using transportation and assignment models for cost-effective decision-making.
4. Equips students with project management tools to analyze and optimize time schedules using network-based techniques.

5. Covers scheduling and inventory models to help manage production flow and stock levels efficiently in industrial systems.

## COURSE OUTCOME:

After completing this course students will be able to:

1. Develop the essential background in Operations Research.
2. Learn to use the LPP in different fields of engineering problems.
3. Learn to use Assignment and Transportation algorithms necessary for practical problems.
4. Acquire basic skills in PERT/CPM.
5. Learn to use Sequencing Problem and Inventory Models for managing practical engineering jobs.

| | |
|---|---|
| **1. Operations Research and It's Mathematical Background** | **06** |
| **1.1** Linear Combination of Vectors, Linear Dependence and Independence.<br>**1.2** Simultaneous Linear Equations and Nature of Solution.<br>**1.3** Convex Analysis,Supporting and Separating Hyperplanes.<br>**1.4** An overview and Definition of OR, Mathematical Modelling, Examples of OR models. | |
| **2. Linear Programming Problem** | **08** |
| 2.1.Graphical Solution Method, Some Exceptional Cases.<br>2.2.General LPP, Canonical and Standard forms of LPP.<br>2.3.Simplex Method: Introduction, Fundamental properties of solutions, the Computational Procedure, Use of Artificial variables. | |
| **3. Assignment Problem, Transportation Problem** | **08** |
| **3.1** The transportation problem,Formulation of Transportation Problem, Initial Feasible Solution Methods, Optimality Test, Degeneracy in Transportation Problem.<br>**3.2** Assignment Problem, Balanced Assignment Problems, Hungarian Method. | |
| **4. PERT/CPM** | **08** |
| **4.1** Network representation, PERT/CPM Network Components and Precedence Relationships.<br>**4.2** Critical path (CPM) networks:<br>4.2.1 Forward Pass Method (For Earliest Event Time)<br>4.2.2 Backward Pass Method (For Latest Allowable Event Time)<br>4.2.3 Float (Slack) of an Activity and Event<br>4.2.4 Critical Path<br>**4.3** PERT networks.<br>4.3.1 Project Scheduling with Uncertain Activity Times.<br>4.3.2 Estimation of Project Completion Time. | |
| **5. Sequencing Problem and Inventory Models** | **08** |
| 5.1.Sequencing Problem, Processing of n Jobs Through Two Machines and ***m*** Machines.<br>5.2.Deterministic Inventory Models: EOQ Model and EOQ Cost Model. Sensitivity Analysis. | |

**Textbooks**


1. Kanti Swarup, P.K. Gupta, Man Mohan, "Operations Research", Sultan Chand & Sons, 2001.
2. Sharma, J.K., "Operations Research-Theory and Applications", 4th Ed. Macmillan India, 2009.


**Reference Books**


1. Hillier & Lieberman, "Operations Research", TMH.
2. Hamdy A. Taha.Operations research: an introduction 8th ed.Pearson Education, Inc.

CO-PO MAPPING

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 3 | 3 |

**SIGNATURES:**

**UNIVERSITY POLYTECHNIC**

**BIRLA INSTITUTE OF TECHNOLOGY MESRA – 835215 (RANCHI)**

**DEPARTMENT OF COMPUTER ENGINEERING**

# DPE 623 CYBER SECURITY

| PROGRAMME: Diploma in Computer Engineering | | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE CODE: **DPE 623** | | | COURSE TITLE: **CYBER SECURITY** | | | | |
| COMPULSORY: Program Elective | | | | | | | |
| Teaching Scheme and Credits | | | | | EXAMINATION SCHEME | | |
| L | T | P | HRS/WK | CREDIT | PE | FINAL | TOTAL |
| 3 | 0 | 0 | 3 | 3 | 50 | 50 | 100 |

## RATIONALE:

1. Helps students understand the growing need for cybersecurity in today's digital world, along with key terminologies and concepts.

3. Provides knowledge of the CIA triad and common cyber threats, enabling students to assess and respond to security risks.
4. Equips students to identify cybercrime tools and analyze attack methods, enhancing their ability to detect and prevent cyber incidents.
5. Teaches basic network structures and defense mechanisms, preparing students to protect networked systems effectively.
6. Familiarizes students with cybersecurity laws and ethical responsibilities, ensuring responsible and lawful practices in the field.

## COURSE OUTCOME:

After completing this course students will be able to:

1. Understand and Identify the need for cybersecurity, basic cybersecurity terminologies, domains, and concepts in the modern digital world.
2. Understand the goals of cybersecurity: confidentiality, integrity, and availability (CIA triad), types of cyber threats, vulnerabilities, and attacks
3. Identify common tools used in cybercrimes (e.g., keyloggers, phishing kits, Trojans) and analyze cybercriminal methods such as social engineering and malware deployment.
4. Explain the basics of network infrastructure and potential security risks, network defense mechanisms (e.g., firewalls, IDS, VPNs).
5. Understand cybersecurity legal frameworks (e.g., IT Act, GDPR), Evaluate ethical responsibilities of cybersecurity professionals

## COURSE CONTENT:

| MODULE | TOPICS/SUBTOPICS |
|---|---|
| 1 | **Introduction:**<br>Computer Security, Threats, Harn, Vulnerabilities and Control.<br>Course Outcome: CO1 Teaching Hours :4 hrs |
| 2 | **Introduction to Cybercrimes:**<br>Classification of cybercrimes<br>E-mail Spoofing, Spamming, Cyber defamation, Internet Time Theft, Hacking, Online Frauds, Computer Sabotage etc.<br>Cybercrime: The Legal Perspectives<br>Cybercrime: An Indian Perspectives<br>Course Outcome: CO2 Teaching Hours :4 hrs |
| 3 | **Tools and Methods used in Cybercrimes:**<br>Introduction<br>Proxy Servers and Anonymizers<br>Phishing<br>Trojan Horses and Backdoors<br>DoS and DDoS attacks<br>SQL Injection, Buffer oveflow<br>Course Outcome: CO3 Teaching Hours :4hrs |
| 4 | **Networks and defenses**<br>Network Concepts, Threats to Network Communications, Wireless Network Security, Denial of<br>Service.<br>Strategic Defenses: Security Countenneasures, Cryptography in Network Security, Firewalls<br>Intrusion Detection and Prevention Systems.<br>Course Outcome: CO4 Teaching Hours :4 hrs |
| 5 | **Legal Issues and Ethics**<br>Protecting Programs and Data, Information and the Law, Rights of Employees and Employers,<br>Redress for Software Failures, Computer Crime, Ethical Issues in Computer Security, Incident<br>Analysis with Ethics.<br>Course Outcome: CO5 Teaching Hours :4 hrs |

**TEXTBOOKS:**

| S. N. | Title | Author, Publisher, Edition and Year of publication | ISBN |
|---|---|---|---|
| 1. | Cryptography and N/W security Principle and Practices", | William Stallings, Prentice Hall. | 9789357059718 |

**REFERENCE BOOKS:**

| S. N. | Title | Author, Publisher, Edition and Year of publication | ISBN |
|---|---|---|---|
| 1. | Cyber Security | Nina Godbole, Willey | 9788126521791 |

CO-PO MAPPING

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 3 | 3 |

SIGNATURES:

## UNIVERSITY POLYTECHNIC
## BIRLA INSTITUTE OF TECHNOLOGY MESRA – 835215 (RANCHI)
## DEPARTMENT OF COMPUTER ENGINEERING

### INTERNET OF THINGS

| PROGRAMME: Diploma in Computer Engineering | | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE CODE: **DPE 624** | | | COURSE TITLE: **INTERNET OF THINGS** | | | | |
| COMPULSORY: Program ELECTIVE | | | | | | | |
| Teaching Scheme and Credits | | | | | EXAMINATION SCHEME | | |
| L | T | P | HRS/WK | CREDIT | PE | FINAL | TOTAL |
| 3 | 0 | 0 | 3 | 3 | 50 | 50 | 100 |

**RATIONALE:**

1. Introduces IoT, M2M communication, architecture, and Arduino for system-level understanding.
2. Covers API design and testing for integrating IoT components.
3. Teaches Bluetooth and WiFi standards for developing connected IoT applications.
4. Offers mini projects for hands-on experience in wireless IoT device control.
5. Explores sensors and microcontrollers essential for building interactive IoT systems.

**COURSE OUTCOMES:**

**After completing this course students will be able to:**

1. Understand IoT and M2M fundamentals, architecture, and Arduino for prototyping IoT solutions.
2. Design, implement, and test APIs for real-world IoT applications.
3. Apply wireless standards like Bluetooth and WiFi for device connectivity and control.
4. Gain hands-on experience in controlling devices via wireless communication through mini projects.
5. Learn to integrate sensors, actuators, and microcontrollers into functional IoT systems.

## COURSE CONTENT DETAILS:

| Module | Topics/Subtopics |
|---|---|
| 1. | **TITLE: The Internet of Things: An Overview**<br>1.1 M2M and Internet of Things Technology Fundamentals<br>1.2 IoT Architecture<br>1.3 design principles and needed capabilities, standards considerations<br>1.4 Introduction to Arduino board<br>1.5 Components of Arduino board<br>Course Outcome: CO1 Teaching Hours: 6 hrs |
| 2. | **TITLE: Online Components**<br>2.1.Getting started with an API<br>2.2. Designing a API<br>2.3Implementing the API & testing<br>2.4Designing a API performing mathematical operations<br>2.5Designing an API for Accessing Mobile Device Sensors<br>Course Outcome: CO2 Teaching Hours: 6 hrs |
| 3. | **TITLE: Wireless Communication standards**<br>3.1 Bluetooth, wifi<br>3.2 PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15)<br>3.3 Wireless HART,Z-Wave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7<br>3.4 Overview of Wifi module, Bluetooth modules<br>3.5 App development for Wifi & Bluetooth connectivity.<br>Course Outcome: CO3 Teaching Hours: 6 hrs |
| 4. | **TITLE: Mini Project**<br>4.1 Turning ON/OFF LED<br>4.2 FadeLED<br>4.3 Turning ON/OFF Bulb<br>4.4 Controlling devices through Bluetooth<br>4.5 Controlling devices through Wifi<br>Course Outcome: CO4 Teaching Hours: 6 hrs |
| 5. | **TITLE: Embedded Devices**:<br>**5.1** Sensors<br>**5.2** Actuators<br>**5.3** Transducer<br>**5.4** Embedded Computing Basics<br>**5.5** Microcontrollers<br>Course Outcome: CO5 Teaching Hours: 6 hrs |

**TEXT BOOKS:**

| S. N. | Title | Author, Publisher, Edition and Year of publication | ISBN |
|---|---|---|---|
| 1. | "Designing the Internet of Things" | McEwen, Adrian, and Hakim Cassimally, John Wiley & Sons, Incorporated, 2013. | 9781118430620 |

**REFERENCE BOOKS:**

| S. N. | Title | Author, Publisher, Edition and Year of publication | ISBN |
|---|---|---|---|
| 1. | "Internet of Things: A Hands-On Approach" | Arsheep Bahga &Vijay Madisetti, Universities Press – 2015 | 9780996025515 |

**CO-PO MAPPING:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

**SIGNATURE:**

## COURSE: MACHINE LEARNING

| PROGRAMME: DIPLOMA IN COMPUTER ENGINEERING | | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE CODE:**DPE625** | | | COURSE TITLE: **MACHINE LEARNING** | | | | |
| COMPULSARY / ELECTIVE: **ELECTIVE** | | | | | | | |
| Teaching Scheme and Credits | | | | | EXAMINATION SCHEME | | |
| L | T | P | HOURS/WEEK | CREDIT | PE | FINAL | TOTAL |
| 3 | 0 | 0 | 3 | 3 | Q-20, TA-5, MID-25 | 50 | 100 |

L= Lecture, T= Tutorial and P= Practical, Q= Quiz, TA= Teacher Assessment, MID= Mid Semester Exam

### RATIONALE:

1. Provides the basics of AI, model training, and types of pattern recognition.
2. Teaches data handling and visualization using key Python libraries.
3. Covers core classification techniques like Naïve Bayes and KNN.
4. Introduces clustering methods to find patterns in unlabeled data.
5. Explains neural networks, deep learning, and applications in image and text recognition.

### COURSE OUTCOMES

| | |
|---|---|
| CO1 | To understand the basics of AI, learning models, and pattern recognition types. |
| CO2 | To gain practical skills in Python for data manipulation and visualization using libraries like NumPy, Pandas, and Matplotlib. |
| CO3 | To learn core classification algorithms such as Naïve Bayes and KNN for predictive modeling. |
| CO4 | To apply clustering techniques like K-Means for discovering patterns in unlabeled data. |
| CO5 | To understand the structure and function of artificial neural networks and their use in image and text recognition tasks. |

## COURSE CONTENT DETAILS:

| MODULES WITH TOPICS |
|---|
| **1. MODULE-I Introduction to AI and Pattern Recognition Basics**<br>1.1. **Overview of AI:** Definition, history, and current applications in fields like healthcare, finance, and transportation etc.<br>1.2. Features, Over fitting and complexity; training, validation, test data.<br>1.3. Types of pattern recognition: supervised, unsupervised etc.<br>Course Outcome: CO1 Teaching Hours: 6 hrs |
| **2. MODULE-II Introduction to Python for AI**<br>2.1 Introduction to Scientific Python libraries: NumPy, SciPy,<br>2.2. Pandas: Working with DataFrames in Python.<br>2.3. Matplotlib: Exploration of Data using Visualization: Bar Chart, Histogram, Distribution or Density Plot, Box Plot, Scatter Plot.<br>2.4 Simple Python exercises in data handling and visualization using Pandas and Matplotlib.<br>Course Outcome: CO2 Teaching Hours: 10 hrs |
| **3. MODULE-III Supervised Learning**<br>3.1. Basic probability concepts, joint and conditional probability, Bayes' theorem.<br>3.2. Bayesian classification for decision making. Naïve Bayes'.<br>3.3. K-Nearest Neighbour Algorithm, KNN Accuracy.<br>*Course Outcome: CO3 Teaching Hours: 8 hrs* |
| **4. MODULE-III Unsupervised Learning**<br>4.1. Clustering: Similarity and Distance Measures<br>4.2 Clustering with K-Means<br>4.3 Python based Data Segmentation using K-Means.<br>*Course Outcome: CO4 Teaching Hours: 8 hrs* |
| **5. MODULE-IV Introduction to ANN and Overview of Deep Learning:**<br>5.1. Biological Neurons and Artificial Neurons.<br>5.2. Simple Model of an Artificial Neuron, Artificial Neural Network Structure, Activation Functions.<br>5.3. Image recognition basics with neural networks.<br>5.4. Text recognition tasks using NLP.<br>5.5. Concepts of deep learning, including convolutional neural networks (CNNs) for image processing.<br>*Course Outcome: CO5 Teaching Hours: 8 hrs* |

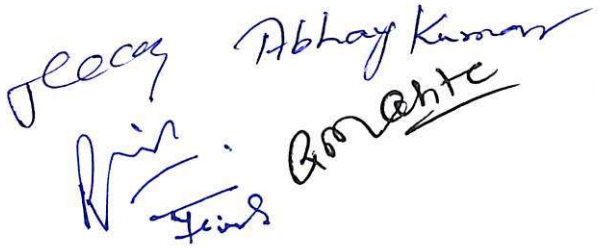
**TEXT AND REFERENCE BOOKS**

| S. N. | Title | Author, Publisher, Edition, and Year of publication | ISBN |
|---|---|---|---|
| 1. | Pattern Recognition and Machine Learning | by Christopher M. Bishop, Springer, 2009. | ISBN-13 :978-1493938438 |
| 2. | Machine Learning | Sridhar, S; Vijayalakshmi, Oxford University Press, 2021 | ISBN-13:978-0-19-012727-5 |
| 3. | GKP Practical Handbook of Machine Learning for Beginners | Bhattacharyya, Subhrajit; Bhattacharyya, Sujit.G.K. Publications (P) Ltd. 2021. | ISBN-13: 978-93-90820-65-8 |
| 4. | Machine Learning | Rahul K. Sarawale , Ganesh V. Karbhari, Nirali Prakashan, 2019. | ISBN-13: 978-93-88706-54-4 |
| 5. | Neural Networks and Deep Learning | Charu C. Aggarwal, Springer (2018). | ISBN 978-3-319-94462-3 |

**CO-PO MAPPING:**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 2 | 2 | 1 | 2 | 3 |
| CO2 | 3 | 1 | 2 | 2 | 1 | 2 | 3 |
| CO3 | 3 | 2 | 2 | 2 | 1 | 2 | 3 |
| CO4 | 3 | 2 | 2 | 2 | 1 | 2 | 3 |
| CO5 | 3 | 2 | 2 | 2 | 1 | 2 | 3 |

**SIGNATURES:**



DPE 626 Computer Oriented Numerical and Statistical Methods

| PROGRAMME: DIPLOMA IN COMPUTER ENGINEERING | | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE CODE:**DPE626** | | | COURSE TITLE: **Computer Oriented Numerical and Statistical Methods** | | | | |
| COMPULSARY / ELECTIVE: **ELECTIVE** | | | | | | | |
| Teaching Scheme and Credits | | | | | EXAMINATION SCHEME | | |
| L | T | P | HOURS/WEEK | CREDIT | PE | FINAL | TOTAL |
| 3 | 0 | 0 | 3 | 3 | Q-20, TA-5, MID-25 | 50 | 100 |

L= Lecture, T= Tutorial and P= Practical, Q= Quiz, TA= Teacher Assessment, MID= Mid Semester Exam

**Pre-Requisite: Mathematics-I, Mathematics-II, Mathematical Foundations of Computer Science (MFCS).**

**CO:** Students will be able to

1. Understand the importance of Error Analysis in Numerical Analysis.
2. Realize the applications of numerical methods in solving Algebraic and Transcendental Equations.
3. Learn to use Interpolation Techniques and apply it to solve Numerical Integration problems.
4. Solve systems of linear equations numerically.
5. Use and learn basic numerical techniques necessary for solving ODEs.

**Contents (Name of Topics)**

| | No. of Lectures |
|---|---|
| **1. Error and Solution of Algebraic and Transcendental Equations** | **06** |
| **1.1** Errors and Their Computations | |
| **1.2** The Bisection Method, Method of False Position, The Iteration Method, Newton-Raphson Method. | |
| **2. Interpolation & Numerical Integration** | **08** |
| **2.1** Finite Differences: Forward Differences, Backward Differences, Central Differences Formula for Interpolation. | |
| **2.2** Interpolation with Unevenly Spaced Points:Lagrange's Interpolation Formula. | |
| **2.3** Numerical Integration: Trapezoidal and Simpson's rule. | |
| **3. Numerical Solution of Linear System of Equations** | **08** |
| **3.1** Direct method- Gauss elimination, Gauss-Jordan, LU decomposition methods. | |
| **3.2** Iterative methods- Gauss-Jacobi & Gauss Seidel methods. | |
| **4. Probability and Distributions** | **08** |

Abhay Kumar

| | |
|---|---|
| **4.1** Sample space - Events - Definition of probability - combinatorial problems - conditional probability and independence. | |
| **4.2** Random variables, Distributions and Mathematical expectations - Discrete distributions - Binomial and Poisson. | |
| **4.3** Continuous distributions –Uniform, Exponential and Normal Distributions. | |
| **5. Hypothesis Testing** | **08** |
| **5.1** Concept of sampling and Sampling distributions - Sampling from Normal distributions - Standard error - Tests of significance. | |
| **5.2** Large sample test for population means and proportions - Test for populations means-single and two sample. | |
| **5.3** Paired t–test. Chi-square tests for goodness of fit and test for independence of attributes in contingency table. | |

**Text& Reference Books**


1. **Numerical Analysis and Computational Procedures 8thEd. by S. A. Mollah, Books & Allied (P) Ltd (8 September 2022), ISBN-10: 9394107053**
2. **Numerical Methods, by Rao V Dukkipati, New Age International Pvt. Ltd.; 2nd edition (August 2021)**
3. **STATISTICAL METHODS (COMBINED VOL), 1ST EDN, by N.G.Das, McGraw Hill Education; 1st edition (July 2017), ISBN-10 : 9780070083271; ISBN-13 : 978-0070083271**


**CO-PO MAPPING:**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 2 | 2 | 1 | 2 | 3 |
| CO2 | 3 | 1 | 2 | 2 | 1 | 2 | 3 |
| CO3 | 3 | 2 | 2 | 2 | 1 | 2 | 3 |
| CO4 | 3 | 2 | 2 | 2 | 1 | 2 | 3 |
| CO5 | 3 | 2 | 2 | 2 | 1 | 2 | 3 |

**SIGNATURES:**

# COURSE: INTRODUCTION TO COMPUTER GRAPHICS

| PROGRAMME: DIPLOMA IN COMPUTER ENGINEERING | | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE CODE:**DOE621** | | | COURSE TITLE: **INTRODUCTION TO COMPUTER GRAPHICS** | | | | |
| COMPULSARY / ELECTIVE: **OPEN ELECTIVE** | | | | | | | |
| Teaching Scheme and Credits | | | | | EXAMINATION SCHEME | | |
| L | T | P | HOURS/WEEK | CREDIT | PE | FINAL | TOTAL |
| 3 | 0 | 0 | 3 | 3 | Q-20, TA-5, MID-25 | 50 | 100 |

**RATIONALE**

This course envisions to impart to students to:

| | |
|---|---|
| A. | This unit introduces the core components and technologies of computer graphics systems, including display types, rendering methods, input/output devices, graphics software, and 3D visualization tools like VR and stereoscopic systems. |
| B. | This unit explains the basic building blocks of computer graphics by focusing on how points, lines, and circles are generated and rendered using efficient algorithms and frame buffer techniques. |
| C. | This unit covers essential 2D transformation techniques using matrix operations to perform and combine geometric changes like translation, rotation, scaling, reflection, and shear in graphical objects. |
| D. | This unit explains the 2D viewing process, including coordinate transformations and various clipping techniques, to control what part of a scene is displayed on the screen. |
| E. | This unit focuses on representing and manipulating 3D objects using polygons, mathematical models, and geometric transformations to create realistic shapes and surfaces in computer graphics. |

**Course Outcomes**

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

| | |
|---|---|
| CO1 | Can perform visual computations for geometrical drawings. |
| CO2. | Can model 2D objects. |
| CO3. | Apply geometrical transformation of the modelled objects. |
| CO4. | Can develop simple Graphical User Interface. |
| CO5. | Students will be able to represent and transform 3D objects using polygon surfaces, curved geometry, and geometric transformation techniques. |

## COURSE CONTENT DETAILS:

| S.NO | MODULE |
|---|---|
| 1. | **Module – I**<br>1. **Introduction to Graphics Systems**:<br>1. 1. Video Display Devices<br>1.2. Raster Scan Systems<br>1.3. Random Scan Systems<br>1.4. Graphics Monitors and Workstations<br>1.5. Input Devices, Hard Copy Devices, Graphics Software.<br>1.6. Three-Dimensional Viewing, Devices, Stereoscopic & Virtual Reality Systems<br><br>**Course Outcome: CO1** **Teaching Hours: 8 hrs** |
| 2. | **Module – II**<br>2. **Output Primitives**:<br>2.1. Points and Lines<br>2.2. Line Drawing Algorithms (DDA and Bresenham's Algorithms)<br>2.3. Loading the Frame Buffer<br>2.4. Circle Generating Algorithm.<br><br>**Course Outcome: CO2** **Teaching Hours: 6 hrs** |
| 3. | **Module – III**<br>3. **2D Transformation**:<br>3.1. Basic Transformations<br>3.2. Matrix Representations and Homogeneous Coordinates<br>3.3. Composite Transformations(Translations, Rotations, Scalings),<br>3.4. Other Transformations (Reflection and Shear)<br><br>**Course Outcome: CO3** **Teaching Hours: 8 hrs** |
| 4. | **Module – IV**<br>**4. 2D Viewing**<br>4.1. The Viewing Pipeline<br>4.2. Viewing Coordinate Reference Frame<br>4.3. Window- to- Viewport Coordinate Transformation<br><br>**Course Outcome: CO4** **Teaching Hours: 6 hrs** |
| 5. | **Module – V**<br>**5. Three-Dimensional Geometric and Modeling Transformations:**<br>5.1. Translation<br>5.2. Rotation<br>5.3. Scaling<br>5.4. Other Transformations<br><br>**Course Outcome: CO5** **Teaching Hours: 8 hrs** |

**TEXT BOOKS:**

| S. N. | Title | Author, Publisher, Edition and Year of publication | ISBN |
|---|---|---|---|
| 1. | "Computer Graphics: C Version" | Hearn D. and Baker M. P, 2nd Edition, Pearson Education, 1994 | 0131615300, 978-0131615304 |
| 2. | "Computer Graphics: Principles andPractice in C" | Foley J. D., Dam A. Van, Feiner S. K. and Hughes J. F., 3rd Edition, Pearson Education, 2013. | 0321399528, 978-0321399526 |

**Mapping of Course Outcomes onto Program Outcomes**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 1 | 2 | 2 |
| CO2 | 3 | 1 | 1 | 1 | 1 | 3 | 1 | 3 | 2 | 3 |
| CO3 | 2 | 3 | 3 | 1 | 2 | 1 | 2 | 2 | 2 | 3 |
| CO4 | 1 | 1 | 3 | 3 | 1 | 1 | 1 | 2 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 1 | 2 | 1 | 1 | 1 | 2 | 3 |

**Correlation Levels 1, 2 or 3 as defined below:**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

**SIGNATURES:**

## COURSE: INTRODUCTION TO MACHINE LEARNING

| PROGRAMME: DIPLOMA IN COMPUTER ENGINEERING | | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE CODE:**DOE622** | | | COURSE TITLE: **INTRODUCTION TO MACHINE LEARNING** | | | | |
| COMPULSARY / ELECTIVE: **ELECTIVE** | | | | | | | |
| Teaching Scheme and Credits | | | | | EXAMINATION SCHEME | | |
| L | T | P | HOURS/WEEK | CREDIT | PE | FINAL | TOTAL |
| 3 | 0 | 0 | 3 | 3 | Q-20, TA-5, MID-25 | 50 | 100 |

L= Lecture, T= Tutorial and P= Practical, Q= Quiz, TA= Teacher Assessment, MID= Mid Semester Exam

**RATIONALE:**

1. Provides the basics of AI, model training, and types of pattern recognition.

2. Teaches data handling and visualization using key Python libraries.

3. Covers core classification techniques like Naïve Bayes and KNN.
4. Introduces clustering methods to find patterns in unlabeled data.

5. Explains neural networks, deep learning, and applications in image and text recognition.

**COURSE OUTCOMES**

| | |
|---|---|
| CO1 | To understand the basics of AI, learning models, and pattern recognition types. |
| CO2 | To gain practical skills in Python for data manipulation and visualization using libraries like NumPy, Pandas, and Matplotlib. |
| CO3 | To learn core classification algorithms such as Naïve Bayes and KNN for predictive modeling. |
| CO4 | To apply clustering techniques like K-Means for discovering patterns in unlabeled data. |
| CO5 | To understand the structure and function of artificial neural networks and their use in image and text recognition tasks. |

## COURSE CONTENT DETAILS:

| MODULES WITH TOPICS |
|---|
| **1. MODULE-I Introduction to AI and Pattern Recognition Basics**<br>1.1. **Overview of AI:** Definition, history, and current applications in fields like healthcare, finance, and transportation etc.<br>1.2. Features, Over fitting and complexity; training, validation, test data.<br>1.3. Types of pattern recognition: supervised, unsupervised etc.<br><br>Course Outcome: CO1 Teaching Hours: 6 hrs |
| **2. MODULE-II Introduction to Python for AI**<br>2.1 Introduction to Scientific Python libraries: NumPy, SciPy,<br>2.2. Pandas: Working with DataFrames in Python.<br>2.3. Matplotlib: Exploration of Data using Visualization: Bar Chart, Histogram, Distribution or Density Plot, Box Plot, Scatter Plot.<br>2.4 Simple Python exercises in data handling and visualization using Pandas and Matplotlib.<br><br>Course Outcome: CO2 Teaching Hours: 10 hrs |
| **3. MODULE-III Supervised Learning**<br>3.1. Basic probability concepts, joint and conditional probability, Bayes' theorem.<br>3.2. Bayesian classification for decision making. Naïve Bayes'.<br>3.3. K-Nearest Neighbour Algorithm, KNN Accuracy.<br><br>*Course Outcome: CO3 Teaching Hours: 8 hrs* |
| **4. MODULE-III Unsupervised Learning**<br>4.1. Clustering: Similarity and Distance Measures<br>4.2. Clustering with K-Means<br>4.3 Python based Data Segmentation using K-Means.<br><br>*Course Outcome: CO4 Teaching Hours: 8 hrs* |
| **5. MODULE-IV Introduction to ANN and Overview of Deep Learning:**<br>5.1. Biological Neurons and Artificial Neurons.<br><br>5.2. Simple Model of an Artificial Neuron, Artificial Neural Network Structure, Activation Functions.<br>5.3. Image recognition basics with neural networks.<br><br>*Course Outcome: CO5 Teaching Hours: 8 hrs* |

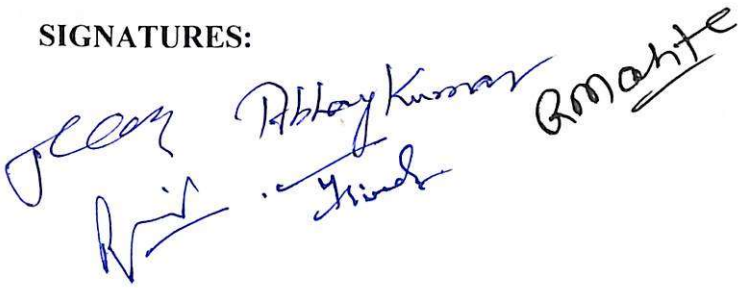
## TEXT AND REFERENCE BOOKS

| S. N. | Title | Author, Publisher, Edition, and Year of publication | ISBN |
|---|---|---|---|
| 1. | Pattern Recognition and Machine Learning | by Christopher M. Bishop, Springer, 2009. | ISBN-13 :978-1493938438 |
| 2. | Machine Learning | Sridhar, S; Vijayalakshmi, Oxford University Press, 2021 | ISBN-13:978-0-19-012727-5 |
| 3. | GKP Practical Handbook of Machine Learning for Beginners | Bhattacharyya, Subhrajit; Bhattacharyya, Sujit.G.K. Publications (P) Ltd. 2021. | ISBN-13: 978-93-90820-65-8 |
| 4. | Machine Learning | Rahul K. Sarawale , Ganesh V. Karbhari, Nirali Prakashan, 2019. | ISBN-13: 978-93-88706-54-4 |
| 5. | Neural Networks and Deep Learning | Charu C. Aggarwal, Springer (2018). | ISBN 978-3-319-94462-3 |

## CO-PO MAPPING:

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 2 | 2 | 1 | 2 | 3 |
| CO2 | 3 | 1 | 2 | 2 | 1 | 2 | 3 |
| CO3 | 3 | 2 | 2 | 2 | 1 | 2 | 3 |
| CO4 | 3 | 2 | 2 | 2 | 1 | 2 | 3 |
| CO5 | 3 | 2 | 2 | 2 | 1 | 2 | 3 |

## SIGNATURES:



# COURSE: INTRODUCTION TO MULTIMEDIA

| PROGRAMME: DIPLOMA IN COMPUTER ENGINEERING | | | | | | | |
|---|---|---|---|---|---|---|---|
| COURSE CODE:**DOE623** | | | COURSE TITLE: **INTRODUCTION TO MULTIMEDIA** | | | | |
| COMPULSARY / ELECTIVE: **OPEN ELECTIVE** | | | | | | | |
| Teaching Scheme and Credits | | | | | EXAMINATION SCHEME | | |
| L | T | P | HOURS/WEEK | CREDIT | PE | FINAL | TOTAL |
| 3 | 0 | 0 | 3 | 3 | Q-20, TA-5, MID-25 | 50 | 100 |

L= Lecture, T= Tutorial and P= Practical, Q= Quiz, TA= Teacher Assessment, MID= Mid Semester Exam

**RATIONALE:**

This course envisions to impart to students to:

| | |
|---|---|
| A. | Introduces the fundamentals of multimedia, its types, architecture, and real-world applications, laying the groundwork for all upcoming modules. |
| B. | Covers the use of text and fonts in multimedia, exploring font types, formatting, and standards like Unicode, essential for clear digital communication. |
| C. | Explains how sound is digitized and represented, including audio properties, formats, and system components, vital for integrating audio in multimedia systems. |
| D. | Teaches image types, color models, compression formats, and editing techniques using Photoshop, building visual design and image processing skills. |
| E. | Focuses on video formats, conversion, capture tools, and animation techniques, providing essential knowledge for dynamic media content creation. |

**COURSE OUTCOMES:**

At the end of the course students will be able to:completion of this course, students will be able to:

| | |
|---|---|
| CO1 | Students will be able to explain the concept, classification, system architecture, and applications of multimedia systems. |
| CO2 | Students will be able to identify and use different text types, fonts, encoding standards, and text formats used in multimedia content. |
| CO3 | Students will be able to describe the characteristics of sound, its digital representation, audio system components, and file formats. |
| CO4 | Students will be able to explain image data types, color models, compression techniques, and apply basic image processing using editing software. |
| CO5 | Students will be able to describe video formats, standards, and animation techniques, and understand the process of video capture and conversion. |

Abhay Kumar
Amdhte

## COURSE CONTENT DETAILS:

| MODULES WITH TOPICS |
|---|
| **MODULE-I Introduction to Multimedia**<br><br>1.1. What is multimedia<br>1.2. Classification of multimedia<br>1.3. Need of Multimedia<br>1.4. Multimedia System Architecture<br>1.5. Evolving Technologies for Multimedia System<br>1.6. Applications of Multimedia.<br><br>**Course Outcome: CO1** **Teaching Hours: 6 hrs** |
| **MODULE-II _Computer Fonts and Hypertext**<br>2.1. Usage of text in Multimedia<br>2.2. Families and faces of fonts<br>2.3. Outline fonts<br>2.4. Bitmap fonts International character sets<br>2.5. Hypertext<br>**Course Outcome: CO2** **Teaching Hours: 6 hrs** |
| **MODULE-III Audio fundamentals and representations**<br>3.1. Digitization of sound<br>3.2. Amplitude, Frequency and sound wave<br>3.3. Decibel system, data rate, audio file format<br>3.4. Sound synthesis, MIDI, wavetable,<br>3.5. Compression and transmission of audio on Internet<br>3.6. Audio software and hardware.<br>*Course Outcome: CO3* *Teaching Hours: 8 hrs* |
| **MODULE – IV : Image fundamentals and representations**<br>4.1. Image data representations ,Type of image<br>4.2. Image acquisition<br>4.3. Image Compression and File Formats :GIF, JPEG, JPEG 2000, PNG, TIFF, PS, PDF<br>4.4. Basic Image Processing using Adobe Photoshop<br>4.5. Use of image editing software, Anti-aliasing, Dithering Retouching,Cloning, Masks, Thresholding, Filters<br><br>*Course Outcome: CO4* *Teaching Hours: 8 hrs* |
| **MODULE-V Video and Animation**<br>5.1. Video Basics , How Video Works<br>5.2. Broadcast Video Standards,<br>5.3. Motion video& Motion picture,<br>5.4. Analog video & Video connectors, Digital video<br>5.5. Video capture software, Video file formats<br><br>*Course Outcome: CO5* *Teaching Hours: 8 hrs* |

## TEXT AND REFERENCE BOOKS

### TEXT BOOKS:

| S. N. | Title | Author, Publisher, Edition and Year of publication | ISBN |
|---|---|---|---|
| 1. | "Principal of Multimedia" | Ranjan Parekh ,McGraw Hill Education (India) Private Limited, 2edition, 2013 | 978-1-25-900650-0 |
| 2. | "Introduction to Multimedia and its Applications" | Dr. V. K. Jain ,Khanna Publication House, 1edition, 2012 | 978-93-81068-57-1 |

### CO-PO MAPPING:

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 2 | 2 | 1 | 2 | 3 |
| CO2 | 3 | 1 | 2 | 2 | 1 | 2 | 3 |
| CO3 | 3 | 2 | 2 | 2 | 1 | 2 | 3 |
| CO4 | 3 | 2 | 2 | 2 | 1 | 2 | 3 |
| CO5 | 3 | 2 | 2 | 2 | 1 | 2 | 3 |

### SIGNATURES: