DEPARTMENT OF PHYSICS

COURSE CURRICULUM & MARKING SCHEME

VALUE ADDED COURSE

M.Sc. I, II, III & IV Semester
PHYSICS

SESSION : 2024-25

ESTD: 1958

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG, 491001 (C.G.)

(Former Name – Govt. Arts & Science College, Durg)

NAAC Accredited Grade A^+, College with CPE - Phase III (UGC),

STAR COLLEGE (DBT), Phone: 0788-2212030

Website - www.govtsciencecollegedurg.ac.in,

Email – autonomousdurg2013@gmail.com

GOVT.V.Y.T.AUTO.PG COLLEGE, DURG (C.G)
M.Sc. I, II, III, IV SEM. (PHYSICS)

VALUE ADDED COURSE

MARKING SCHEME

The assessment procedure includes evaluation of theoretical background knowledge and practical skills in checking, correcting and calibrating various laboratory equipment.

Category	Mark
Theory	60
Practical	40

Name & Signature of Members of Board of Studies

V.C. Nominee	Departmental members
Subject Expert	1. H.O.D/ Dr. Jagjeet Kaur Saluja .....
Subject Expert	2. Dr. R. S. Singh .....
Alumni (member).....	3. Dr. Anita Shukla .....
Prof. from other Dept. of Sc. Faculty	4. Dr. Siteshwari Chandraker .....
Specialist from Industry.....	5. Dr. Abhishek Kumar Misra .....
	6. Dr. Kusumanjali Deshmukh.....

GOVT.V.Y.T.AUTO.PG COLLEGE, DURG (C.G)
Class: M.Sc. I, II, III, IV SEM. (PHYSICS)

VALUE ADDED COURSE

VPH-01: Hands-On Basic Electronic Circuits, Electrical Circuits and Instrumentation

SYLLABUS

Course code: VPH-01 **Duration: 30 Hours**

Overview: This course is designed for undergraduate. Participants will gain substantial knowledge of the basics of Electronic and Electrical Circuits.

Course Objectives:

- Introduction of Electronic and Electrical Devices and Components.
- Introduction of Electronic and Electrical Instruments.
- Introduction of Electronic and Electrical circuits.
- Designing of Electronic and Electrical circuits using software.

Course outcome:

By successfully completing the course, students will be able to:
• Get well –acquainted with the basics of Electronic and Electrical circuit designing and measurements.
• Also become capable to implement the software for the designing of circuits.

Module 1 (5 Hrs)

The following module introduce Electronic and Electrical Instruments along with hands on:

- To learn the operation of Multimeter.
- To learn the operation of Function Generators.

Module 2 (5 Hrs)

The following module introduce Electronic and Electrical Instruments along with hands on:

- To learn the operation of CRO.
- Measurement of voltage frequency using CRO.
- Measurement of frequency and phase using Lissajous pattern.

Module 3 (5 Hrs)

The following module introduce Electronic and Electrical Components along with hands on:

- To study the all-types resistances and their colour code chart.
- To study the all-types capacitance and their colour code chart.
- To study the inductance and transformers.

Module 4 (5 Hrs)

The following module introduce Electronic and Electrical Devices along with hands on:

- To identify and check the types of diodes
- To identify and check the types of transistors.

Module 5 (5 Hrs.)

The following module introduce Electronic and Electrical circuits using software along with hands on:

- To learn the design technique of PCB using PCB designing software (ULTIBOARD, PROTEL, EXPRESS LAB etc.).

Module 6 (5 Hrs)

The following module introduce Electronic and Electrical circuits along with hands on:

- To learn the design technique of PCB using PCB designing software (ULTIBOARD, PROTEL, EXPRESS LAB etc.).
- To learn soldering technique.

References

[1] Principle of Electronics Mehta V.K, S. Chand & Co. Ltd, 4th 2000.

[2] Laboratory manual for electronic devices and circuits Bell, Prentice-hall, New- Delhi,4th Edition.

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Class: M.Sc. I, II, III, IV SEM. (PHYSICS)

VALUE ADDED COURSE

VPH-02: Hands-on ExpEYES and Arduino Software

SYLLABUS

Course Code: VPH -02 **Duration: 30 Hours**

Overview: This course is designed for undergraduate, postgraduate students and research scholars. Participants will gain knowledge on ExpEYES and Arduino Software.

Course Objectives:

- Introduction of basic Electronic devices and circuits.
- Provide Hands-On training on ExpEYES software.
- Provide Hands-On training on Arduino software.

Course outcome:

By successfully completing the course, students will be able to:

- Understands that how to design an electronic circuits and its simulation.

Course content

Module 1 (5 Hrs)

The following module introduces the basics of Electronic Devices and Circuits:

- Diode Based Circuits
- Transistor Based Circuits
- VI-Characteristics Curves and parameters

Module 2 (5 Hrs)

The following module introduces the ExpEYES Software:

- Installation
- Features
- Study of logic gates.
- Study of OPAMP as inverting and non-inverting amplifier.

Module 3 (5 Hrs)

The following module introduces experiments using ExpEYES Software:

- Study of the V-I characteristics of diodes.
- Study of the CE configuration of transistor.
- Study of the half wave rectifier using PN junction.

Module 4 (5 Hrs)

The following module introduces experiments using ExpEYES Software:

- Study of the full wave rectifier using PN junction.
- Study of the clipping circuit using PN junction diode.
- Study of the clamping using PN junction diode.

Module 5 (5 Hrs)

The following module introduces the Arduino Software:

- Installation
- Features
- Introduction to Basic,Digital,Analog and Communication Commands.
- Experiment to glow the LED.

Module 6 (5 Hrs)

The following module introduces experiments using Arduino Software:

- Determining of the value of acceleration due to gravity.
- Analysis capacitors charging and discharging curve from data obtained by Arduino.
- Measurement of speed of sound using ultrasonic sensor and its activation using clap switch.

References

[1] ARDUINO PROJECT HANDBOOK, Mark Geddes, San Francisco

[2] ExpEYES study material.

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Class: M.Sc. I, II, III, IV SEM. (PHYSICS)

VALUE ADDED COURSE

VPH-03: Nano Science

SYLLABUS

Course code: VPH-03 **Duration: 30 Hours**

Overview: This course is designed for undergraduate, postgraduate students and research scholars. Participants will gain knowledge on nano science/technology and its applications.

Course Objectives:

The content of the course is designed to make students able to understand:

1. Variation of properties of materials at Nano-scale,
2. Synthesis methods of Nano-particles,
3. Characterization techniques to characterize Nano-materials,
4. Some basic carbon based Nano-materials,
5. Application of Nano-particles.

Course outcome:

After going through the syllabus, students will be able to:

1. Correlate material properties with size in Nano-region,
2. Synthesize different Nano-size particles,
3. Analyse particle properties using analytical techniques,
4. Learn about some recent carbon based Nano-materials,
5. Learn the applications of Nano-materials.

Course content

Module 1 (5 Hrs)

PHVAC I: Physics of Nanomaterials Significance of Nano-scale materials – surface area and quantum confinement effect, Quantum well, Quantum dot, Size dependent properties – mechanical, thermal, electrical, optical and magnetic. Brus equation for quantum dots.

Module 2 (5 Hrs)

PHVAC II:Nano-fabrication techniques Top down and bottom up approaches to nanofabrication, Electron beam lithography, Ball milling, Thin film deposition, Chemical bath deposition, Hydrothermal method, Sputtering, Sol Gel Techniques.

Module 3 (5 Hrs)

PHVAC III:Characterization of Nanomaterials

AFM, SEM, TEM, Electron spectroscopy techniques – AEX, XPS.

Module 4 (5 Hrs)

PHVAC IV: Nanomaterials and Applications Carbon-based nanomaterials, carbon nanotubes, Fullerens, Graphene, Nano composites; Application of nanomaterials: Mechanical and Biomedical applications, Optoelectronic applications, Super capacitors, Future of nano-science.

Module 5 (5 Hrs)

1. Synthesis of nanomaterials by chemical bath deposition
2. Study of optical absorption (VIS-UV) of nanoparticles

Module 6 (5 Hrs)

1. Luminescence study of nanoparticles

References

1. The Physics of Low Dimensional Semiconductors: by John H. Davies (CambridgeUniversityPress)
2. Nanotehnology – An introduction : by J. J. Ramsden, William Andrew (Elsevier).
3. Quantum Heterostructures – Microelectronics &Optoelectronics : by V. V.Mitin, V. A.Kochetp& M. A. Stroscio (Cambridge University Press)
4. Nanostructures &Nanomaterial : Synthesis, Properties & Applications : by Guozhong Cao Imperial College Press, London)
5. Nanomaterials : Synthesis, Properties & Applications : by A. S. Edelstein & R. C.
6. Commorata (Institute of Physics Publishing, Bristol & Philadelphia)
7. Introduction to Nanotechnology : by C. P. Poole, Jr. Frank J. Owens (John Wiley & Sons)
8. Nanotechnology : by M. Wilson, K. Kannangara, G. Smith, M. Simmons & B. Raguse(Overseas Press).

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Class: M.Sc. I, II, III, IV SEM. (PHYSICS)
VALUE ADDED COURSE
VPH-04: Hands-On on MATLAB Programming and Modelling
SYLLABUS

Course code: 04 **Duration: 30 Hours**

Overview: This course is designed for undergraduate, postgraduate students and research scholars. Participants will gain substantial knowledge of MATLAB software.

Course Objectives:

- Introduction of installation, properties and applications of MATLAB software.
- Provide information and training on various features of the software.
- Introduction to modelling capability of the MATLAB.

Course outcome:

By successfully completing the course, students will be able to:

• Get well –acquainted with the powerful and versatile software.

• Also become capable to implement the software for any real time applications and also in research purposes.

Course content

Module 1 (5 Hrs)

The following module introduce the MATLAB basics along with installation and Hands-On:

- Introduction to MATLAB
- What is MATLAB?
- MATLAB Customers
- The Math Works Products
- Introduction to MATLAB Desktop
- Working with different variables
- MATLAB Demonstrations
- How to Quit MATLAB?

Module 2 (5 Hrs)

The following module introduce the Vectors, Matrices and Operators in MATLAB along with Hands-On:

- The MATLAB Array Creating Vectors and Matrices Creating Sub Matrices of a Given Matrix
- Changing the Elements of a Given Matrix
- Creating Special Matrices
- Concatenation Operators
- Matrix Operators
- Matrix Multiplication and Inversion
- Array operators
- Relational Operators
- Logical Operators
- Properties of a Matrix Replicating Data to Form a Matrix

Module 3 (5 Hrs)
The following module introduce MATLAB Graphics and Plotting along with Hands-On:

- Introduction
- Dimensional Plots
- Plot Aesthetics
- Changing the Axis
- Adding Text
- Multiple Plots
- Using a Single Plot Command
- Using Multiple Plot Commands
- Sub-plotting
- Some Other Useful 2-D Plots

Module 4 (5 Hrs)
The following module introduce Control Structures, Loops, and Functions along with Hands-On:

- Introduction
- Conditional Statements
- Loops
- Nested Loops
- Functions

Module 5 (5 Hrs.)
The following module introduce some applications of MATLAB Control Structures, Loops, and Functions along with Hands-On:

- Interpolation
- Curve Fitting
- numerical optimization
- symbolic calculation
- integral
- partial fraction expansion using MATLAB

Module 6 (5 Hrs)
The following module introduce Modelling with Simulink along with Hands-On:

- Introduction
- Opening a New Model File
- Creating Blocks
- Setting the Parameters and Making Connections
- Setting the Simulink Configuration Parameters
- Running/stopping the Simulation
- Display of Response

References

[1] A User manual of MATLAB, Ver.6.5.

[2] MATLAB and SIMULINK: Introduction to Applications, Third Edition, Partha S. Mallick, SCITECH.

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Class: M.Sc. I, II, III, IV SEM. (PHYSICS)
VALUE ADDED COURSE
Hands-On on Digital Image Processing using MATLAB
SYLLABUS

Course code: 05 **Duration: 30 Hours**

Overview: This course is designed for undergraduate, postgraduate students and research scholars. Participants will gain knowledge on Digital Image Processing(DIP) and Hands-On on image processing techniques using MATLAB software.

Course Objectives:

- Introduction of image processing electronically.
- Provide Hands-On training on image processing software.

Course outcome:

By successfully completing the course, students will be able to:

- Understands that how an image can be read, modify and write according to the application requirement.
- Working with the MATLAB image processing toolbox.

Course content

Module 1 (5 Hrs)

The following module introduce the Digital Image Fundamentals:

- Digital Image Representation
- Colour Images
- Colour Models
- Summary of Eye Properties
- Image Collections

Module 2 (5 Hrs)

The following module introduce the Digital Image Processing Toolbox in MATLAB:

- Introduction to MATLAB
- MATLAB System
- Image Processing Toolbox
- MATLAB Commands
- Graphical User Interface

Module 3 (5 Hrs)

The following module introduce Image Transformations along with Hands-On:

- 1D Discrete Transformation
- 2D Discrete Transformation
- Properties of Transformation
- 2D Discrete Sine Transformation

Module 4 (5 Hrs)

The following module introduce Image Enhancement along with Hands-On:

- Point Processing
- Histogram Equalization
- Histogram Specification

- Local Enhancement
- Image Subtraction
- Image Smoothening
- Image Sharpening

Module 5 (5 Hrs)

The following module introduce Image Restoration and Recognition along with Hands-On:

- Image Degradation Model
- Unconstrained Restoration
- Inverse Filtering
- Least Mean Square Filter
- Classification Technique

Module 6 (5 Hrs.)

The following module introduce Image Compression along with Hands-On:

- Coding Redundancies Based Image Compression
- Interpixel Redundancy Based Image Compression
- Psychovisual Redundancy Based Image Compression

References

[1] Gonzalez R. and Woods R. and S.L Eddins, 'The Digital Image Processing using MATLAB', Pearson Education, Inc,2004.

[2] Introduction to Image Processing Toolbox, MATLAB Documentation.

[3] A User manual of MATLAB, Ver.6.5.

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