

DEPARTMENT OF PHYSICS

COURSE CURRICULUM & MARKING SCHEME

M.Sc. PHYSICS

Semester - IV

SESSION : 2023-24



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)

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DEPARTMENT OF PHYSICS
GOVT. V.Y.T. PG. AUTONOMOUS COLLEGE DURG

Programme Outcomes (POs)

At the end of M. Sc. (Physics) students will be able to:

- PO1: Knowledge:** Acquire an overview of concepts, fundamentals and advancements of science across a range of fields; with in-depth knowledge in at least one area of study. Develop focused field knowledge and amalgamate knowledge across different disciplines.
- PO2: Complementary skills:** Students will be able to engage in critical investigation through principal approaches or methods and through effective information search and evaluation strategies. Employ highly developed conceptual, analytical, quantitative and technical skills and are adept with a range of technologies
- PO3: Applied learning:** Students will be able to apply disciplinary or interdisciplinary learning across multiple contexts, integrating knowledge and practice. Recognize the need for information; effectively search for, evaluate, manage and apply that information in support of scientific investigation or scholarly debate
- PO4: Communication:** Communicate effectively on scientific achievements, basic concepts and recent developments with experts and with society at large. Able to comprehend and write reports, documents, make effective presentations by oral and/or written form.
- PO5: Problem-solving:** Investigate, design and apply appropriate methods to solve problems in science, mathematics, technology and/or engineering.
- PO6: Environment and sustainability:** Understand the impact of the solutions in ethical, societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.
- PO7: Teamwork, collaborative and management skills:** Recognize the opportunities and contribute positively in collaborative scientific research. Engage in intellectual exchange of ideas with researchers of other disciplines to address important research issues

Programme Specific outcomes

At the end of M. Sc. (Physics) students will be able to:

- PSO1** Students are expected to acquire core knowledge in modern physics, including the major premises of classical mechanics, electromagnetic theory, and optical electronics.
- PSO2** Students are also expected to develop written and oral communication skills in optical fibre communicating physics-related topics.
- PSO3** Students would learn how to design and conduct an experiment (or series of experiments) demonstrating their understanding of the scientific method and processes.
- PSO4** Students are expected to understand the analytical methods required to interpret and analyze results and draw conclusions as supported by the experimental data or existing theories.

Name and Signatures

V.C. Nominee	Departmental members
Subject Expert <i>26/07/2022</i>	1. H.O.D Dr. Jagjeet Kaur Saluja <i>26/7</i>
Subject Expert.....	2. Dr. R. S. Singh <i>26/7</i>
Alumni (member).....	3. Dr. Anita Shukla <i>26/7</i>
Prof. from other Dept. of Sc. Faculty <i>26/7/22</i>	4 Mrs. Siteshwari Chandrakar <i>26/7/2022</i>
Specialist from Industry..... <i>26/7/22</i>	5. Dr. Abhishek Kumar Misra <i>26/7/22</i>
	6. Dr. Kusumanjali Deshmukh <i>26/7/22</i>

DEPARTMENT OF PHYSICS
GOVT. V.Y.T. PG. AUTONOMOUS COLLEGE DURG
 Approved syllabus for M.Sc. (PHYSICS) Semester IV by the members of Board of
 Studies
 for the Session (2023-24)

Semester IV

The syllabus with the paper combinations is as under

Paper I MPH401: LASER PHYSICS & APPLICATION OF LASER	Paper II MPH402: COMPUTATIONAL PHYSICS & FORTRAN PROGRAMMING
Paper III MPH403: SPECIAL PAPER- III ELECTRONICS	Paper IV MPH404 A/ B/C/D/E/F/G: Special Paper- IV Electronics/ Informatics/ Physics of Liquid crystal/ Physics of Nano Material/ Atmospheric Science/ Astronomy and Astrophysics/ Diagram Techniques
Paper V MPHL07: PROJECT WORK	Paper VI MPHL08: LAB COURSE - 8086 MICROPROCESSOR, ARDUINO and EXPEYES

Name and Signatures

V.C. Nominee	Departmental members
Subject Expert <i>Narneta</i> <i>26/07/2022</i>	1. H.O.D Dr. Jagjeet Kaur Saluja <i>J.K. Saluja</i> <i>26/7/22</i>
Subject Expert.....	2. Dr. R. S. Singh <i>R.S. Singh</i>
Alumni (member).....	3. Dr. Anita Shukla <i>Anita Shukla</i>
Prof. from other Dept. of Sc. Faculty <i>P. Singh</i> <i>26/7</i>	4 Mrs. Siteshwari Chandrakar <i>S. Chandrakar</i> <i>26/7/22</i>
Specialist from Industry..... <i>Singh</i>	5. Dr. Abhishek Kumar Misra <i>A. Misra</i>
	6. Dr. Kusumanjali Deshmukh..... <i>K. Deshmukh</i> <i>26/7/22</i>

**Marking Scheme for M.Sc. (PHYSICS) Semester IV
Session 2023-24**

Paper No.	Title of the Paper	Marks Allotted in Theory		Marks Allotted in Internal Assessment	
		Max	Min	Max.	Min.
I	MPH401: LASER PHYSICS & APPLICATION OF LASER	80	16	20	04
II	MPH402: COMPUTATIONAL PHYSICS & PROGRAMMING	80	16	20	04
III	MPH403: SPECIAL PAPER-III ELECTRONICS	80	16	20	04
IV	MPH404 A/ B/C/D/E/F/G: Special Paper- IV Electronics/ Informatics/ Physics of Liquid crystal/ Physics of Nano Material/ Atmospheric Science/ Astronomy and Astrophysics/ Diagram Techniques	80	16	20	04
V	MPL07: PROJECT WORK	100	34
VI	MPL08: LAB COURSE - 8086 MICROPROCESSOR, ARDUINO and EXPEYES	100	34
	Total	520	80

04 Theory papers	-	320
04 Internal Assessments	-	80
Practical	-	100
Project	-	100
Total Marks	-	600

The Scheme of Internal Assessment
Session 2023-24 M.Sc. (PHYSICS) Semester IV

Paper No.	Paper Name	Test Marks I	Test Marks II	Home Assignment/Seminar III	Total
I	MPH401: LASER PHYSICS & APPLICATION OF LASER	20 Marks	20 Marks	20 Marks	Average of Best of Test and Home Assignment/Seminar(20 Marks)
II	MPH402: COMPUTATIONAL PHYSICS & PROGRAMMING	20 Marks	20 Marks	20 Marks	Average of Best of Test and Home Assignment/Seminar(20 Marks)
III	MPH403: SPECIAL PAPER- III ELECTRONICS	20 Marks	20 Marks	20 Marks	Average of Best of Test and Home Assignment/Seminar(20 Marks)
IV	MPH404 A/ B/C/D/E/F/G: Special Paper- IV Electronics/ Informatics/ Physics of Liquid crystal/ Physics of Nano Material/ Atmospheric Science/ Astronomy and Astrophysics/ Diagram Techniques	20 Marks	20 Marks	Only one seminar (20 marks) Presentation (10 marks) Viva (10marks)	Average of Best of Test and Home Assignment/Seminar(20 Marks)

Note: Compulsory submits one hardcopy and softcopy of ppt after presentation.

Name and Signatures

Name and Signatures	Departmental members
V.C. Nominee	1. H.O.D Dr. Jagjeet Kaur Saluja
Subject Expert <i>Narnaeet</i> <i>26/07/2022</i>	2. Dr. R. S. Singh <i>R.S.S</i> <i>26/7</i>
Subject Expert.....	3. Dr. Anita Shukla <i>AS</i>
Alumni (member).....	4 Mrs. Siteshwari Chandrakar <i>Siteshwari</i> <i>26/7/22</i>
Prof. from other Dept. of Sc. Faculty <i>P. Singh</i> <i>26/7/22</i>	5. Dr. Abhishek Kumar Misra
Specialist from Industry..... <i>P. Singh</i> <i>26/7/22</i>	6. Dr. Kusumanjali Deshmukh <i>Kusumanjali</i> <i>26/7</i>

Question Paper Format and Distribution of Marks for PG Semester Examination

Question paper format for the Post-Graduate Examination have the following main points

The question paper will be of **80 marks**

1. Questions will be asked Unit-wise in each question paper.
2. From each Unit, the questions will be asked as follows:
 - Q.1 Very short answer type question
(Answer in one or two sentences) (02 Marks)
 - Q.2 Very short answer type question
(Answer in one or two sentences) (02 Marks)
 - Q.3 Short answer type question (Answer in 200-250 words) (04 Marks)
 - Q.4 Long answer type questions (Answer in 400-450 words) (12 Marks)

Type of Question	Unit-I	Unit-II	Unit-III	Unit-IV
Very Short (2 Questions) (Maximum two sentences)	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks	2 x 2 = 4 Marks
Short (1 Question) 200-250 words	1 x 4 = 4 Marks	1 x 4 = 4 Marks	1 x 4 = 4 Marks	1 x 4 = 4 Marks
Long answer (1 Question) 400-450 words	1 x 12 = 12 Marks	1 x 12 = 12 Marks	1 x 12 = 12 Marks	1 x 12 = 12 Marks

Note:

1. Question no. 1 and Question 2 will be compulsory.
2. Question no. 3 and 4 will consist of 2 optional questions of which one has to be attempted.
3. As mentioned above, two compulsory very short answer type questions (2+2 marks), one short answer type question with internal choice (4 marks) and one long answer type question with internal choice (12 marks) will be asked from each unit.
Thus, there will be questions of 20 marks from each unit and of total 80 marks from all the four units of the syllabus/syllabi.
4. Internal Assessment Examination will be as follows:
 - i. Two Internal Test in each paper (20 marks).
 - ii. Seminar (Power point presentation) in any one of the papers (20 marks).
 - iii. Assignment in each of the remaining papers (excluding the paper of Seminar) (20 marks).
 - iv. Average of marks obtained in best of internal test + seminar in any one paper and marks obtained in internal test + assignment in rest of the papers will be calculated and taken into consideration.

Name and Signatures

V.C. Nominee	Departmental members
Subject Expert <i>Nameeta</i> <i>26/07/2022</i>	1. H.O.D Dr. Jagjeet Kaur Saluja <i>JK</i> <i>26/7/22</i>
Subject Expert.....	2. Dr. R. S. Singh <i>RSS</i>
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Prof. from other Dept. of Sc. Faculty <i>PK</i> <i>26/7/22</i>	4 Mrs. Sitieshwari Chandrakar <i>SC</i> <i>26/7/22</i>
Specialist from Industry..... <i>Di</i> <i>26/7/22</i>	5. Dr. Abhishek Kumar Misra <i>AM</i>
	6. Dr. Kusumanjali Deshmukh <i>KD</i> <i>26/7/22</i>

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

2023-24

M.Sc. (Physics) Semester-IV

Paper- I

MPH401: LASER PHYSICS & APPLICATION OF LASER

Course Outcomes

After successful completion of the course, the student would be able to:

- CO1 Understand and explain basic Laser principles, Laser behaviour, Properties of laser radiations, Different types of Lasers and Laser applications
- CO2 Explain different types Laser used and make a comparison between them.
- CO3 Develop familiarity with the vast areas of laser application , especially in spectroscopy
- CO4 Explore important connections between theory, experiment, and current applications of laser

Name and Signatures

Name and Signatures	
V.C. Nominee	Departmental members
Subject Expert <i>26/10/2022</i>	1. H.O.D Dr. Jagjeet Kaur Saluja <i>26/10/22</i>
Subject Expert.....	2. Dr. R. S. Singh <i>26/10/22</i>
Alumni (member).....	3. Dr. Anita Shukla <i>26/10/22</i>
Prof. from other Dept. of Sc. Faculty <i>26/10/22</i>	4 Mrs. Sitieshwari Chandrakar <i>26/10/22</i>
Specialist from Industry..... <i>26/10/22</i>	5. Dr. Abhishek Kumar Misra <i>26/10/22</i>
	6. Dr. Kusumanjali Deshmukh..... <i>26/10/22</i>

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

SYLLABUS FOR 2023-24

M.Sc. (Physics) Semester-IV

Paper- I

MPH401: LASER PHYSICS & APPLICATION OF LASER

Min. Marks: 16

Max. Marks: 80

UNIT-I

- Laser Characteristics: Directionality, Intensity, Monochromatic Coherence, Kinetics of optical absorption, line-broadening mechanisms. Population inversion, Laser pumping.
- Resonators, Vibrational modes of resonators, Number of modes per unit volume, Quality factor Q, Losses inside the cavity, the threshold conditions.
- Modes of rectangular cavity, Mode selection, Q-switching, mode locking in lasers, General spherical resonator, higher order modes, Hole Burning.

UNIT-II Laser System:

- Ruby Laser: A three level system, pumping power, spiking.
- Neodymium Lasers: Nd-YAG Laser, Nd-Glass Laser.
- Semiconductor Lasers: Central features, Intrinsic, doped and injection Laser, application.
- Gas Laser: Nitrogen (Vibronic) Lasers, Carbon dioxide laser excimer laser.

UNIT-III

- Laser spectroscopic Techniques: Raman Scattering, Stimulated Raman effect, Hyper Raman Effect, Photo-acoustic Raman spectroscopy(PARS)
- Nonlinear interaction of light with matter: Harmonic generation, Phase matching optical mixing, parametric generation of light, self-focusing.
- Multiphoton processes & applications: Multiquantum photoelectric effect, theory of two photon processes, Doppler free two photon spectroscopy, multiphotons processes, phase conjugate optics (elementary) parametric light oscillators.

UNIT-IV

Applications of Lasers:

Optical Fibre communication: optical fibres numerical aperture, pulse dispersion in step index fibers, modal analysis for a step index fiber, pulse dispersion, multimode fibers, first and second generation fiber optic communication, single mode fiber Gaussian approximation, splice loss, vector modes optical fibre communications laser ranging, A brief description of Laser applications in industry, medicine, astronomy and biology. Application of laser in Isotope separation.

REFERENCES -

- B.B.Laud -Laser and nonlinear optics.
- Ghatak & Tyagrajan – Laser and its application.

Name and Signatures

Name and Signatures	Departmental members
V.C. Nominee	1. H.O.D Dr. Jagjeet Kaur Saluja
Subject Expert	2. Dr. R. S. Singh
Subject Expert.....	3. Dr. Anita Shukla
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GOVT. V.Y.T. P.G. AUTONOMOUS COLLEGE, DURG (C.G.)

2023-24

M.Sc. (Physics) Semester – IV

Paper –II

MPH402: COMPUTATIONAL PHYSICS & FORTRAN PROGRAMMING

Course Outcomes

After successful completion of the course, the student would be able to:

- CO1 Learn and apply different numerical methods such as Newton for physical problems.
- CO2 Understand and analyze data by interpolation and curve fitting etc.
- CO3 Learn and solve ODE using Picard's Method, Taylor Series expansion
- CO4 Apply Newton's forward and backward difference formula , Stirling's formula for numerical differentiation . Use trapezoidal and Simpson's rule for numerical Integration.

Name and Signatures

V.C. Nominee	Departmental members
Subject Expert <i>J. Anand</i> 26/07/2022	1. H.O.D Dr. Jagjeet Kaur Saluja <i>J. Kaur</i> 26/7/22
Subject Expert.....	2. Dr. R. S. Singh <i>R. S. Singh</i>
Alumni (member).....	3. Dr. Anita Shukla <i>Anita Shukla</i>
Prof. from other Dept. of Sc. Faculty <i>P. Singh</i> 26/7/22	4 Mrs. Sitieshwari Chandrakar <i>S. Chandrakar</i> 26/07/22
Specialist from Industry..... <i>D. Singh</i>	5. Dr. Abhishek Kumar Misra <i>Abhishek Misra</i>
	6. Dr. Kusumanjali Deshmukh..... <i>K. Deshmukh</i> 26/7

**GOVT. V.Y.T. P.G. AUTONOMOUS COLLEGE, DURG (C.G.)
SYLLABUS FOR 2023-24**

M.Sc. (Physics) Semester – IV

Paper –II

MPH402: COMPUTATIONAL PHYSICS & FORTRAN PROGRAMMING

Min.Marks: 16

Max.Marks:80

UNIT-1 Solution of algebraic and transcendental equation, Newton-Raphson method, bisection method, Regula – Falsi method, Iteration method, rate of convergence of Newton’s method when there exist double roots gauss iterative method. Method of Solution using the inverse of the matrix, jacobies method eigen value and eigen vector matrices.

UNIT-2 Finite difference and Interpolation: (1) Finite difference forward difference, back ward difference, central difference. (2) Difference of polynomial. (3) Factorial notation, Newton’s Interpolation formulae, central difference interpolation formulae. Choice of an interpolation formulae interpolation with unequal intervals.

Curve fitting: Graphical method, principle of least Square, method of least squares and cubic spline Error’s in the cubic spline derivatives.

UNIT-3 Numerical solution of ordinary differential equation (ODE) : Picard’s method, Taylor series method Euler’s method . Modified Euler’s method .**Runge’s Method:** Runge-Kutta method.

Predictor corrector method : Milne’s method, Adam-Bashforth’s method.

Solution of partial differential equation: function of two or more variables (ii) partial derivates.

UNIT-4 Numerical differentiation : Formula for derivatives - Derivatives using Newton’s forward difference formula, Derivatives using Newton’s backward difference formula, Derivatives using Stirling’s central difference formula, Maxima and Minima of a tabulated function.

Numerical Integration: Newton-Cote’s Quadrature formula - Trapezoidal rule, Simpson’s one-third rule, Simpson’s three-eighth rule and Boole’s rule.

FORTRAN programmes on least square fit for straight line, solution of ODE by Euler’s method, by Runge-Kutta 2nd order and 4th order methods; Trapezoidal rule and Simpson’s one-third rule.

. REFERENCES:-

1. Introduction method of numerical Analysis by Sastry
2. Numerical Analysis by Rajaraman
3. Numerical Methods by B. S. Grewal
4. Numerical Analysis by Bhupendra Singh
5. Numerical Methods by Dr. P. Kandasamy, Dr. K. Thilagavathy & Dr. K. Gunavathi
6. Calculus of Finite Difference & Numerical Analysis by Gupta & Malik
7. Fortran 77 & Numerical Methods by C. Xavier

Name and Signature

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
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Specialist from Industry.....	5. Dr. Abhishek Kumar Misra
	6. Dr. Kusumanjali Deshmukh.....

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

2023-24

M.Sc. (Physics) Semester-IV

Paper - III

MPH403: Special Paper- III ELECTRONICS

Course Outcomes

After successful completion of the course, the student would be able to:

- CO1 Get familiarized with Amplitude Modulation, its principle and applications
- CO2 Present mathematical representation of different modulation techniques.
- CO3 Learn and apply sampling theorem for Mathematical representation of of FM and PM signal, inter system comparison (FM & AM) generation of FM direct & indirect method.
- CO4 Understand and compare different computer communication systems viz. LAN, WAN and MAN, Wireless network, Network topology, etc.

Name and Signature

V.C. Nominee	Departmental members
Subject Expert <i>26/07/2022</i>	1. H.O.D Dr. Jagjeet Kaur Saluja <i>26/07/22</i>
Subject Expert.....	2. Dr. R. S. Singh <i>26/07/22</i>
Alumni (member).....	3. Dr. Anita Shukla <i>26/07/22</i>
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	6. Dr. Kusumanjali Deshmukh..... <i>26/07/22</i>

GOVT.V.Y.T. P.G. AUTONOMOUS COLLEGE, DURG (C.G.)
SYLLABUS FOR (2023-24)
M.Sc. (Physics) Semester-IV
Paper - III

MPH403: Special Paper- III ELECTRONICS

Min. Marks: 16

Max.Marks:80

UNIT-I **Amplitude modulation:** frequency spectrum of AM, average power, average voltage, modulation index for multiple sign waves modulator, balance modulator, signal side band SSB, generation/method, SSB detection, Transmitter and receivers: Super heterodyne receiver, AM Transmitters.

UNIT-II **Angle modulation:** Mathematical representation of of FM and PM signal, inter system comparison (FM & AM); generation of FM direct & indirect method. Phase Modulation.

UNIT-III **Digital Communication:** Pulse modulation system. Sampling theorem, low pass and band pass signals. Pulse-Amplitude modulation, Channel Band width for a PAM signal, Natural sampling, signal recovery through holding, Differential PCM, Delta modulation.
Digital techniques: ASK, PSK and FSK, DPSK QPSK, generation and detection.

UNIT-IV **Computer communication system:** LAN, WAN and MAN, Wireless network, Network topology, OSI and TCP/IP reference model, comparison between them and their criticism, basic idea about ISDN. Time Division Multiple Access (TDMA) Frequency Division Multiple Access (FDMA), ALOHA.

REFERENCES:

1. Principle of communication system Taub & Schilling
2. Communication system-Simon Haykin.
3. Communication system- R.P.Singh & S.D.Sapre.
4. Data Communication and Networking Behrouz A. Forouzan

Name and Signature

	Departmental members
V.C. Nominee	1. H.O.D Dr. Jagjeet Kaur Saluja
Subject Expert <i>Namruchi</i> <i>26/07/2022</i>	2. Dr. R. S. Singh
Subject Expert.....	3. Dr. Anita Shukla
Alumni (member).....	4 Mrs. Sitieshwari Chandrakar
Prof. from other Dept. of Sc. Faculty	5. Dr. Abhishek Kumar Misra
Specialist from Industry..... <i>Dingde</i>	6. Dr. Kusumanjali Deshmukh..... <i>26/7/22</i>

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

2023-24

M.Sc. (Physics) Semester-IV

Paper-IV

MPH404A: Special Paper- IV ELECTRONICS

Course Outcomes

After successful completion of the course, the student would be able to:

- CO1 Get familiarized with different types of microprocessors.
- CO1 To understand advance microprocessor related to different addressing.
- CO2 Understand 8088 and 8086 memory interfaces.
- CO3 Understand basic I/O interface.

Name and Signature

Name and Signature	
V.C. Nominee	Departmental members
Subject Expert <i>Nameeli</i> <i>26/07/2022</i>	1. H.O.D Dr. Jagjeet Kaur Saluja <i>JK</i> <i>26/7/22</i>
Subject Expert.....	2. Dr. R. S. Singh <i>R.S.S.</i>
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Specialist from Industry..... <i>PS</i>	5. Dr. Abhishek Kumar Misra <i>AKM</i>
	6. Dr. Kusumanjali Deshmukh <i>KD</i> <i>26/7/22</i>

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

SYLLABUS FOR (2023-24)

M.Sc. (Physics) Semester-IV

Paper-IV

MPH404A: Special Paper- IV ELECTRONICS

Min. Marks: 16

Max. Marks:80

- UNIT- I Architecture of 8086:**
Difference between 8085 and 8086, overview of 8086 Microprocessor Family, Architecture and Pin configuration of 8086.
System Bus structure : Basic 8086 system bus architecture, Minimum mode configuration, maximum mode configuration.
- UNIT-II ADVANCE MICROPROCESSORS**
(i) Real mode and protected mode addressing.
(ii) Data addressing, program memory addressing.
(iii) Data movement Instructions MOV; push/pop.
(iv) Arithmetic and logic instruction (Addition subtraction, multiplication), Basic logic instruction.
(v) Program Control Instructions : Jump Group Controlling, the flow of assembly language program.
- UNIT-III MEMORY INTERFACE:**
(ii) Memory Devices.
(iii) Address decoding
(iv) 8086 (8bit) (16bit) memory Interface
(v) Basic idea about 32 bit and 64 bit memory interface (optional reading)
(vi) Dynamic Ram.
- UNIT-IV BASIC I/O INTERFACE:**
(i) Introduction to I/O interface;
(ii) Basic descriptive idea of Peripheral interface like 8255, 8279 (key board display) 8255(Functional description only)
(iii) Analog to Digital and Digital to Analog Converter.
(iv) Interrupts (Optional Reading Only), Basic interrupt processing (purpose, type, and interrupt instruction only)

REFERENCES:

1. Microprocessor – By B. Ram
2. Microprocessor - By Vibhute
3. Internal Microprocessor Architecture (8086- up to Pentium IV-By Barry R. Bray.
4. Advanced Microprocessors and Peripherals- by K.M. Bhurchandi and A. K. Ray.

V.C. Nominee	Departmental members
Subject Expert <i>Namruti 26/07/2022</i>	1. H.O.D Dr. Jagjeet Kaur Saluja <i>J.K. Saluja 26/07/22</i>
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Alumni (member).....	3. Dr. Anita Shukla <i>A. Shukla 26/07/22</i>
Prof. from other Dept. of Sc. Faculty <i>P. Singh 26/07/22</i>	4 Mrs. Siteshwari Chandrakar <i>S. Chandrakar 26/07/22</i>
Specialist from Industry..... <i>S. Singh 26/07/22</i>	5. Dr. Abhishek Kumar Misra <i>A. Misra 26/07/22</i>
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GOVT.V.Y.T. P.G. AUTONOMOUS COLLEGE, DURG (C.G.)

2023-24

M.Sc. (Physics) Semester-IV

Paper-IV (Elective Paper)

MPH404B: INFORMATICS (DATA COMMUNICATION)

Course Outcomes

After successful completion of the course, the student would be able to:

- CO1 Understand and explain switching circuits and propagation delay.
- CO2 Learn and Discuss network access control and optical fiber communication
- CO3 Explain rate of transmission band width and Hartley Shamon law.
- CO4 Apply methods for error correction codes for line control and network overview.

Name and Signature

V.C. Nominee	Departmental members
Subject Expert <i>[Signature]</i> 26/07/22	1. H.O.D Dr. Jagjeet Kaur Saluja <i>[Signature]</i> 26/7/22
Subject Expert.....	2. Dr. R. S. Singh <i>[Signature]</i>
Alumni (member).....	3. Dr. Anita Shukla <i>[Signature]</i>
Prof. from other Dept. of Sc. Faculty <i>[Signature]</i> 26/7/22	4 Mrs. Siteshwari Chandrakar <i>[Signature]</i> 26/7/22
Specialist from Industry..... <i>[Signature]</i>	5. Dr. Abhishek Kumar Misra <i>[Signature]</i>
	6. Dr. Kusumanjali Deshmukh..... <i>[Signature]</i> 26/7/22

GOVT.V.Y.T. P.G. AUTONOMOUS COLLEGE, DURG (C.G.)
SYLLABUS FOR (2023-24)
M.Sc. (Physics) Semester-IV
Paper-IV (Elective Paper)
MPH404B: INFORMATICS

Unit I

Multiplexing (FDM, TDM), Switching paradigms (circuit, packet and cell switching), Propagation Delay, Clock Synchronization.

Unit II

Network access control (centralized, decentralized, distributed) Overview of Satellite Communication, Broadcast Channel and Optical Fibre Communication Systems. Power and Energy spectra, Distortionless Transmission, Signal distortion over a Channel.

Unit III

Bandwidth and Rate of Transmission, Communication in Noisy channels, Optimum Signal Detection, Channel capacity, Hartley Shannon Law,

Unit IV

Error Correcting Codes. Error control, Line control, Rate control, Repeaters, Concentrators, Regenerators. Link behavior, Pe, Burst error, Optimum picket size, Error control, Elementary coding ideas, ATM as a transport mechanism, An overview of Telecom Network, ISDN.

Text and Reference Books

1. Data communication by Reid and Bartskor
2. Data Networks by Gallager
3. Data Communication by Wiliam Staling
4. Communication networks by Leon -Garcia and Widjaja
5. Introduction to communication systems by S. Haykins
6. Analog and Digital Communication by S. Haykins

Name and Signature

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

GOVT.V.Y.T. P.G. AUTONOMOUS COLLEGE, DURG (C.G.)
2023-24

M.Sc. (Physics) Semester-IV
Paper-IV (Elective Paper)
MPH404C: PHYSICS OF LIQUID CRYSTALS

Course Outcomes

After successful completion of the course, the student would be able to:

- CO1 Describe the structures, symmetries, order, and phase transitions of the most important liquid crystal phases
- CO2 Understand the basic electric, elastic, and optical properties of liquid crystal materials
- CO3 Explain the structure and function of liquid crystal displays and devices.
- CO4 Discuss questions and problems related to liquid crystal science and applications, and to propose solutions/draw sound conclusions by combining knowledge of liquid crystal physics.

Name and Signature

V.C. Nominee	Departmental members
Subject Expert <i>Maneeti</i> 26/07/2022	1. H.O.D Dr. Jagjeet Kaur Saluja <i>Jagjeet</i> 26/07/22
Subject Expert.....	2. Dr. R. S. Singh <i>R.S. Singh</i>
Alumni (member).....	3. Dr. Anita Shukla <i>Anita</i>
Prof. from other Dept. of Sc. Faculty <i>P. S. Singh</i> 26/07/22	4 Mrs. Sitieshwari Chandrakar <i>Sitieshwari</i> 26/07/22
Specialist from Industry..... <i>S. Singh</i>	5. Dr. Abhishek Kumar Misra <i>Abhishek</i>
	6. Dr. Kusumanjali Deshmukh..... <i>Kusumanjali</i> 26/7

GOVT.V.Y.T. P.G. AUTONOMOUS COLLEGE, DURG (C.G.)
SYLLABUS FOR (2023-24)
M.Sc. (Physics) Semester-IV
Paper-IV (Elective Paper)
MPH404C: PHYSICS OF LIQUID CRYSTALS

Unit I

Classification of Liquid Crystals

Symmetry, structure and classification of liquid Crystals, Polymorphism in thermotropics, Reentrant phenomena in liquid crystals, Blue phases, Polymer liquid crystals, Distribution functions and order parameters, macroscopic and microscopic order parameters. Measurement of order parameters, magnetic resonance, electron spin resonance, Raman Scattering and X- ray diffraction.

Unit II

Theories of Liquid Crystalline Phase Transitions

Nature of phase transitions and critical phenomena in liquid crystals, hard particle, Maier-Saupe and Van der Waals theories for nematic - isotropic and nematic-smectic A transitions; Landau theory: Essential ingredients, application to nematic-isotropic, nematic-smectic A transitions and transitions involving smectic phases.

Unit III

Continuum theory

Curvature elasticity in nematic and smectic A phases, distortions due to magnetic and electric Fields, magnetic Coherence length, Fredericksz transition, field-induced cholesteric-nematic transition.

Dynamical Properties of Nematics

The equations of nematodynamics, Laminar flow, molecular motions.

Unit IV

Optical properties of Cholesterics

Optical properties of an ideal helix, agents influencing the pitch, liquid crystal displays.

Ferroelectric Liquid Crystals

The properties of smectic C continuum description, smectic C -smectic A transition, applications.

Discotic Liquid Crystals

Symmetry and structure, mean-field description of discotic liquid crystals, continuum description Lyotropic liquid crystals and biological membrane. Applications of liquid crystals.

Text and Reference Books

1. Chandrasekhar: Liquid Crystals.
2. Vertogen & de Jeu: Thermotropic Liquid Crystals: Fundamentals,
3. de Gennes & Prost: The Physics of Liquid Crystals
4. Introduction to liquid crystals: Physics and Chemistry (1997, Taylor and Francis)
5. Elston & Sambles: The Optics of Thermotropic Liquid Crystal
6. Collyer: Liquid Crystal Polymers: From Structures to Applications
7. Goodby et al.: Ferroelectric Liquid Crystals: Principles, Properties & Applications

Name and Signature

V.C. Nominee	Departmental members
Subject Expert <u>26/07/2022</u>	1. H.O.D Dr. Jagjeet Kaur Saluja <u>26/7/22</u>
Subject Expert.....	2. Dr. R. S. Singh <u>26/7/22</u>
Alumni (member).....	3. Dr. Anita Shukla <u>26/7/22</u>
Prof. from other Dept. of Sc. Faculty <u>26/7/22</u>	4 Mrs. Sitieshwari Chandrakar <u>26/7/22</u>
Specialist from Industry..... <u>26/7/22</u>	5. Dr. Abhishek Kumar Misra <u>26/7/22</u>
	6. Dr. Kusumanjali Deshmukh..... <u>26/7/22</u>

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

2023-24

M.Sc. (Physics) Semester-IV

Paper-IV (Elective Paper)

MPH404D: PHYSICS OF NANOMATERIALS

Course Outcomes

After successful completion of the course, the student would be able to:

- CO1 Describe nanomaterial structures, their synthesis techniques and develop ideas for newer methods
- CO2 Illustrate and present distinguishing features of carbon nanostructures. Analyse its electrical, mechanical and vibrational properties
- CO3 Realize effect of compositions of different bulk nanostructures and present its application.
- CO4 Present theoretical interpretation of quantum well, quantum dots and wires and apply it for infrared detectors and superconductivity.

Name and Signature

V.C. Nominee	Departmental members
Subject Expert <i>7/11/2022</i> <i>M. P. S.</i>	1. H.O.D Dr. Jagjeet Kaur Saluja <i>J. K. Saluja</i> <i>20/11/22</i>
Subject Expert.....	2. Dr. R. S. Singh <i>R. S. Singh</i>
Alumni (member).....	3. Dr. Anita Shukla <i>Anita Shukla</i>
Prof. from other Dept. of Sc. Faculty <i>P. S.</i> <i>20/11/22</i>	4 Mrs. Sitieshwari Chandrakar <i>S. Chandrakar</i> <i>20/11/22</i>
Specialist from Industry..... <i>D. Singh</i>	5. Dr. Abhishek Kumar Misra <i>A. K. Misra</i>
	6. Dr. Kusumanjali Deshmukh <i>K. Deshmukh</i> <i>20/11/22</i>

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

SYLLABUS FOR (2023-24)

M.Sc. (Physics) Semester-IV

Paper-IV (Elective Paper)

MPH404D: PHYSICS OF NANOMATERIALS

Unit-I: Nano Materials

Properties of Nano-Particles: Metal Nano-clusters: Magic Numbers, theoretical modelling of nanoparticles, geometric and electronic structure, Reactivity, Fluctuations, magnetic clusters, Bulk to Nano transition. Semiconducting nanoparticles: optical properties, Photo fragmentation, Columbic Explosion. Rare gas and molecular clusters: Inert-Gas Clusters, Superfluid Clusters, Molecular Clusters. Methods of Synthesis: RF Plasma, Chemical Methods, Thermolysis, Pulsed Laser Methods.

UNIT II: Carbon Nanostructures

Carbon Molecules: Nature of Carbon Bonds, New Carbon Structures. Carbon Clusters: Small Carbon Clusters, Discovery of C_{60} , Structure of C_{60} and its Crystal, Alkali-Doped C_{60} , Superconductivity in C_{60} , Larger and Smaller Fullerenes, Other Bucky balls. Carbon Nanotubes: Fabrication, structure, Electrical Properties, Vibrational Properties, Mechanical Properties. Applications of Carbon Nanotubes: Field Emission and Shielding Computers, Fuel Cells, Chemical Sensors, Catalysis, Mechanical Reinforcement.

UNIT III: Bulk Nanostructured Materials

Solid Disordered Nanostructures: Methods of Synthesis, Failure Mechanisms of Conventional Grain-Sized Materials, Mechanical Properties, Nanostructured Multilayers, Electrical Properties, Other Properties, Metal Nano cluster Composite Glasses, Porous Silicon. Nanostructured Crystals: Natural Nano crystals, Computational Prediction of Cluster Lattices, Arrays of Nanoparticles in Zeolites, Crystals of Metal Nanoparticles, Nanoparticle Lattices in Colloidal Suspensions, Photonic Crystals. Nanostructured Ferromagnetism: Basics of Ferromagnetism, Effect of Bulk Nano structuring of Magnetic Properties, Dynamics of Nano magnets, Nano pore Containment of Magnetic Particles, Nano carbon Ferro magnets, Giant and Colossal Magneto resistance, Ferro fluids.

UNIT IV: Quantum Wells, Wires and Dots, Self-Assembly and Catalysis

Preparation of Quantum Nanostructures, Size and Dimensionality Effects: Size Effects, Conduction Electrons and Dimensionality, Fermi Gas and Density of States, Potential Wells, Partial Confinement, Properties Dependent on Density of States. Excitons, Single- Electron Tunneling, Applications: Infrared Detectors, Quantum Dot Lasers. Superconductivity.

Self-Assembly: Process of Self-Assembly, Semiconductor Islands, Monolayers. Catalysis: Nature of Catalysis, Surface Area of Nanoparticles, Porous Materials, Pillared Clays, Colloids.

Nanomachines and Nanodevices: Microelectromechanical Systems (MEMSS), Nanoelectromechanical Systems (NEMSS): Fabrication, Nanodevices and Nanomachines. Molecular and Supermolecular Switches.

TEXT AND REFERENCE BOOKS

1. Nanstructures & Nanomaterials: Synthesis, Properties & Applications : Guozhang Cao.
2. Introduction to Nanotechnology : Charles P. Poole Jr and Franks J. Qwens.
3. Handbook of Analytical instruments : R. S. Khandpur
4. Nano materials: Synthesis properties, characterization and application : A.S Edelstein and Nano R. C. Cammaratra.
5. Nanotechnology : Kohlr, Michael.
6. X-ray diffraction procedures : H. P. Klung and L. E. Alexander
7. The Powder Method IV : Azaroff and M. J. Buerger
8. Elements of X-ray diffraction : B. D. Cullity
9. Differential Thermal Analysis : R.C. Mackenzie
10. Thermal Methods of Analysis : W. W. Wendlandt

Name and Signature

V.C. Nominee	Departmental members
Subject Expert <i>Jamneet</i> <i>26/07/2022</i>	1. H.O.D Dr. Jagjeet Kaur Saluja <i>Jamneet</i> <i>26/7/22</i>
Subject Expert.....	2. Dr. R. S. Singh <i>R.S.S.</i> <i>26/7/22</i>
Alumni (member).....	3. Dr. Anita Shukla <i>AS</i>
Prof. from other Dept. of Sc. Faculty <i>P.S.</i> <i>26/7/22</i>	4 Mrs. Sitieshwari Chandrakar <i>S.C.</i> <i>26/07/22</i>
Specialist from Industry..... <i>D. Singh</i> <i>26/7/22</i>	5. Dr. Abhishek Kumar Misra <i>A.K.M.</i>
	6. Dr. Kusumanjali Deshmukh..... <i>K.D.</i> <i>26/7/22</i>

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

2023-24

M.Sc. (Physics) Semester-IV
Paper-IV (Elective Paper)
MPH404E ATMOSPHERIC SCIENCE

Course Outcomes

After successful completion of the course, the student would be able to:

- CO1 Apply laws of thermodynamics to explain adiabatic processes and heat balance of earth-atmosphere system. Understand circulation theorem, voracity and continuity of energy equations for dynamic meterology.
- CO2 Understand and explain monsoon dynamics and numerical methods and atmospheric models.
- CO3 Enumerate role of meteorology on atmospheric pollution. Understand and explain working of environmental instrumentation systems.
- CO4 Describe radar principle of radar technology, signal processing and its application.

Name and Signature

V.C. Nominee	Departmental members
Subject Expert <i>Nameeli 26/07/22</i>	1. H.O.D Dr. Jagjeet Kaur Saluja <i>JKaur 26/7/22</i>
Subject Expert.....	2. Dr. R. S. Singh <i>R.S.S. 26/7/22</i>
Alumni (member).....	3. Dr. Anita Shukla <i>AS 26/7/22</i>
Prof. from other Dept. of Sc. Faculty <i>Pur 26/7/22</i>	4 Mrs. Siteshwari Chandrakar <i>SC 26/7/22</i>
Specialist from Industry..... <i>S. S. 26/7/22</i>	5. Dr. Abhishek Kumar Misra <i>AKM 26/7/22</i>
	6. Dr. Kusumanjali Deshmukh..... <i>KD 26/7/22</i>

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

SYLLABUS FOR (2023-24)

M.Sc. (Physics) Semester-IV

Paper-IV (Elective Paper)

MPH404E ATMOSPHERIC SCIENCE

UNIT I

Physical Meteorology

Atmospheric composition, laws of thermodynamics of the atmosphere. Adiabatic process, Potential temperature. The Clausius-Clapeyron equation, laws of black body radiation, solar and terrestrial radiation, Albedo, Green house effect, Heat balance of earth-atmosphere system.

Dynamic Meteorology

Fundamental forces, non-inertial reference frames and apparent forces, structure of static atmosphere. Momentum, continuity and energy equations, Thermodynamics of the dry atmosphere, elementary applications of the basic equations.

The circulation theorem, vorticity, potential vorticity, vorticity and potential vorticity equations.

UNIT II

Monsoon Dynamics

Wind, temperature and pressure distribution over India in the lower, middle and upper atmosphere during pre, post and mid-monsoon season. Monsoon circulation in the meridional (Ψ -2) and zonal (X-Y) planes, energy cycle of monsoon. Dynamics of monsoon depressions and easterly waves. Intra seasonal and interannual variability of monsoon. Quasi-weekly and 30-60 day oscillations. ENSO and dynamical mechanism for their existence.

Numerical Methods for atmospheric Models

Filtering of sound and gravity waves, filtered forecast equations, basic concepts of quasi-geostrophic and primitive equation models, one level and multi-level models. Basic concepts of initialization and objective analysis for wave equation, advection equation and diffusion equation.

UNIT III

Atmospheric Pollution

Role of meteorology on atmospheric pollution, Atmospheric boundary layer, air stability, local wind structure, Ekman spiral, turbulence boundary layer scaling.

Residence time and reaction rates of pollutants, sulphur compounds, nitrogen compounds, carbon compounds, organic compounds, aerosols, toxic gases and radio active particles trace gases.

Atmospheric Instrumentation Systems

Ground based instruments for the measurement of Temperature, Pressure, Humidity, Wind and Rainfall Rate.

Air borne instruments-Radiosonde, Rawinsonde, Rocketsonde-satellite instrumentation (space borne instruments)

UNIT IV

Radar Meteorology

Basic meteorology-radar principles and technology-radar signal processing and display-weather radar-observation of precipitating systems-estimation of precipitation-radar observation of tropical cyclones, use of weather radar in aviation, clear air radars-observation of clear air phenomena-other radar systems and applications.

Text and Reference Books

1. The Atmosphere by Frederick K.Lutgens and Edward J.Tarbuk (for chapter | and VI)
2. Dynamic Meteorology by Holton, J.R. 3" edition, Academic Press N.YI, (1992). The Physics of Monsoons, By
3. RN.Keshvamurthy and M.Shankar Rao, Alied Publishers, 1992 (for chapter 3)
4. 'Numerical Weather Prediction, by G.J. Haltiner and R.-Vilians, John Wiley and sons, 1880 (for chapter 4)
5. Principles of Air pollution meteorology by Tom Lyons and Prilscott, CBS publishers & Distributors (P) Ltd,
6. Radar Meterology by Henry Saugageot

Name and Signature

V.C. Nominee	Departmental members
Subject Expert <i>Sameer</i> <i>26/07/2022</i> <i>Md. Jib</i>	1. H.O.D Dr. Jagjeet Kaur Saluja <i>Jagjeet</i> <i>26/7/22</i>
Subject Expert.....	2. Dr. R. S. Singh <i>R.S. Singh</i>
Alumni (member).....	3. Dr. Anita Shukla <i>Anita</i>
Prof. from other Dept. of Sc. Faculty <i>P. K.</i> <i>26/7/22</i>	4 Mrs. Sitieshwari Chandrakar <i>Sitieshwari</i> <i>26/7/22</i>
Specialist from Industry..... <i>B. S.</i>	5. Dr. Abhishek Kumar Misra <i>Abhishek</i>
	6. Dr. Kusumanjali Deshmukh..... <i>Kusumanjali</i> <i>26/7/22</i>

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

2023-24

M.Sc. (Physics) Semester-IV

Paper-IV (Elective Paper)

MPH404F: ASTRONOMY AND ASTROPHYSICS-I

Course Outcomes

After successful completion of the course, the student would be able to:

- CO1 Appreciate H-R diagram and analyse it for stellar distribution. Explain basic equations relating to stellar interiors.
- CO2 Understand and explain formation and evolution of stars
- CO3 Describe and classify life cycle of stars and its various state. Also able to decide its end life.
- CO4 Discuss and explain solar physics related to its magnetic field, winds and chromosphere

Name and Signature

V.C. Nominee	Departmental members
Subject Expert <i>Jameeli</i> 26/07/22	1. H.O.D Dr. Jagjeet Kaur Saluja <i>Jagjeet</i> 26/7/22
Subject Expert.....	2. Dr. R. S. Singh <i>R.S.</i>
Alumni (member).....	3. Dr. Anita Shukla <i>Anita</i>
Prof. from other Dept. of Sc. Faculty <i>P.</i> 26/7/22	4 Mrs. Siteshwari Chandrakar <i>Siteshwari</i> 26/7/22
Specialist from Industry..... <i>S.</i>	5. Dr. Abhishek Kumar Misra <i>Abhishek</i>
	6. Dr. Kusumanjali Deshmukh..... <i>Kusumanjali</i> 26/7/22

GOVT.V.Y.T. P.G. AUTONOMOUS COLLEGE, DURG (C.G.)
SYLLABUS FOR (2023-24)
M.Sc. (Physics) Semester-IV
Paper-IV (Elective Paper)
MPH404F: ASTRONOMY AND ASTROPHYSICS-I

- Unit - I** Stars-apparent magnitudes, Colour index, Spectral classification, Stellar distances, Absolute magnitude, The H-R diagram of stars.
Stellar interiors: The basic equations of stellar structure, Hydrostatic equilibrium, Thermal equilibrium, Virial Theorem, Energy sources, Energy transport by radiation and convection, Equation of state.
- Unit – II** Formation and evolution of stars: Inter stellar dust and gas, Formation of protostars, Pre-main sequence evolution, Post main sequence evolution and Evolution on the main sequence for low and high mass stars, Late stages of evolution, Fate of massive stars, Supernovae and its characteristics.
- Unit – III** End states of stars, degenerate states, White dwarfs, and Chandrasekhar limit, Neutron stars and Pulsars, Black holes.
Binary stars and their classification, close binaries, Roche Lobes, Evolution of semidetached systems: Algols, Cataclysmic variables and X-ray binaries.
- Unit – IV** Solar Physics: Physical Characteristics of sun, Photosphere: Limb darkening, Granulation, Faculae, Solar Chromosphere and Corona, Prominences, Solar Cycle and Sunspots, Solar Magnetic Fields, Theory of Sunspots, Solar flares, solar wind, Helioseismology.
- Observational and Conceptual foundations of Newtonian gravity and General Theory of Relativity (GR), Principle of Equivalence, Metric tensor, Covariant differentiation, Riemann curvature tensor, Geodesics.
Stress- Energy tensor, Einstein's field equations, Schwarzschild metric, Particle trajectories in Schwarzschild space-time, Precession of Perihelion, Gravitational red-shift and bending of light.

TEXT AND REFERENCE BOOKS

1. Astrophysics for Physicists, Arnab Rai Choudhuri, Camb. University Press, 2010.
2. Modern Astrophysics, B.W. Carroll and D.A. Ostlie, Addison-Wealey Pub.Co.
3. Introductory Astronomy and Astrophysics, M.Zeilik and S.A. Gregory, 4th edition, Saunders college publishing.
4. Theoretical Astrophysics, vol. - II: Stars and stellar systems, T. Padmanabhan, Cambridge university press.
5. The Physical Universe: An introduction to astronomy, F.Shu, Mill valley: University science books.

Name and Signature

V.C. Nominee	Departmental members
Subject Expert <i>Maneets</i> <i>26/07/2022</i> <i>M.P.B.</i>	1. H.O.D Dr. Jagjeet Kaur Saluja <i>Jagjeet</i> <i>26/7/22</i>
Subject Expert.....	2. Dr. R. S. Singh <i>R.S.S.</i>
Alumni (member).....	3. Dr. Anita Shukla <i>Anita</i>
Prof. from other Dept. of Sc. Faculty <i>Pand</i> <i>26/7/22</i>	4 Mrs. Sitieshwari Chandrakar <i>Sitieshwari</i> <i>26/07/22</i>
Specialist from Industry..... <i>Dr. Suresh</i>	5. Dr. Abhishek Kumar Misra <i>Abhishek</i>
	6. Dr. Kusumanjali Deshmukh..... <i>Kusumanjali</i> <i>26/7/22</i>

GOVT.V.Y.T. P.G. AUTONOMOUS COLLEGE, DURG (C.G.)
2023-24

M.Sc. (Physics) Semester-IV
Paper-IV (Elective Paper)
MPH404G: DIAGRAM TECHNIQUES

Course Outcomes

After successful completion of the course, the student would be able to:

- CO1 Learn many body problem.
- CO2 Understand Time dependent Operators.
- CO3 Describe and plot Graphical representation of the expansion.

CO4 Derive Green's equation and it's application.
Name and Signature

V.C. Nominee	Departmental members
Subject Expert <i>20/07/22</i>	1. H.O.D Dr. Jagjeet Kaur Saluja <i>26/7/22</i>
Subject Expert.....	2. Dr. R. S. Singh <i>26/7/22</i>
Alumni (member).....	3. Dr. Anita Shukla <i>26/7/22</i>
Prof. from other Dept. of Sc. Faculty <i>26/7/22</i>	4 Mrs. Siteshwari Chandrakar <i>28/7/22</i>
Specialist from Industry..... <i>26/7/22</i>	5. Dr. Abhishek Kumar Misra <i>26/7/22</i>
	6. Dr. Kusumanjali Deshmukh..... <i>26/7/22</i>

GOVT.V.Y.T. P.G. AUTONOMOUS COLLEGE, DURG (C.G.)
SYLLABUS FOR (2023-24)
M.Sc. (Physics) Semester-IV
Paper-IV (Elective Paper)
MPH404G: DIAGRAM TECHNIQUES

UNIT 1 Formalism of Second Quantization

Quantum mechanical many body problem, boson and fermion systems, Creation and Annihilation operators, Commutation Relations, Vacuum state. The Hamiltonian in terms of creation and annihilation operators and its matrix elements for the simple cases of one- and two-particle systems.

UNIT 2 Time Dependent Operators

Schrodinger, Heisenberg and Interaction picture Time development operator (TDO), its properties and equation of motion, The integral equation for TDO and formal solution by iterative method, Dyson chronological operator, S-matrix expansion, Universality of S-matrix Transition matrix, The adiabatic hypothesis and correspondence with usual perturbation theory.

UNIT 3 Introduction to Graphs

Creation and destruction operator in the interaction picture, Particle and hole operators. Reduction of chronological products. Normal product. Contraction of operators and Wick's theorem. Graphical representation of the expansion. First order graphs, Higher order graphs. The interaction term and ground state energy. Evaluation of the contributions of various graphs to the perturbation series, Linked and unlinked diagrams.

UNIT 4 Introduction to Green's Function

Differential equations and their Green's functions. Examples of time independent Schrodinger equation. Resolvent operators. The single particle Green's function. Physical interpretation. Fourier transform of the Green's functions. Lehmann Representation and Kramer-Kronig relationship. Analytic properties and physical meaning of the poles, Relation between Green's function and the properties of the ground state. Its relation With elementary excitations. Concept of quasi particles.

Text and Reference Books

1. Raimes: Many Electron Theory.
2. Mandi: introduction to Quantum Field Theory.
3. Abrikosov: Quantum Field Theoretical Methods in Statistical Physics.
4. Fretter & Walecha: Quantum Theory of Many-particle Systems.
5. March, Young & Sampantha: The Many Body Problems in Quantum Mechanics.
6. Mattuch: Feynman Daigram Techniques.

Name and Signature

V.C. Nominee	Departmental members
Subject Expert <i>26/07/2022</i>	1. H.O.D Dr. Jagjeet Kaur Saluja <i>26/07/22</i>
Subject Expert.....	2. Dr. R. S. Singh <i>26/07/22</i>
Alumni (member).....	3. Dr. Anita Shukla <i>26/07/22</i>
Prof. from other Dept. of Sc. Faculty <i>26/07/22</i>	4 Mrs. Siteshwari Chandrakar <i>26/07/22</i>
Specialist from Industry..... <i>26/07/22</i>	5. Dr. Abhishek Kumar Misra <i>26/07/22</i>
	6. Dr. Kusumanjali Deshmukh..... <i>26/07/22</i>

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

SYLLABUS FOR (2023-24)

M.Sc. (Physics) Semester- IV
Paper - V

MPHL07: PROJECT WORK

Min. Marks: 34

Max. Marks: 100

Scheme of Marks:

Max. Marks: 100 marks

Project : 60 marks

Sessional: 20 marks

Viva: 20 marks

A Project work will be allotted to the students of M.Sc. III Sem and it will be submitted in IV Sem. Project may be undertaken in any reputed Institute/ Industry/P.G. departments of University or College.

Evaluation of Project work: The Project report duly, signed by the supervisor under whose guidance the work is completed and the Head of the department or institution where the project is completed, shall be submitted to the Physics department of College. Evaluation of the project will be done by the external examiner.

Name and Signature

V.C. Nominee	Departmental members
Subject Expert <i>Nameeta</i> 26/07/22	1. H.O.D Dr. Jagjeet Kaur Saluja <i>Jagjeet</i> 26/07/22
Subject Expert.....	2. Dr. R. S. Singh <i>R.S.S.</i> 26/07/22
Alumni (member).....	3. Dr. Anita Shukla <i>AS</i>
Prof. from other Dept. of Sc. Faculty <i>P.S.</i> 26/07/22	4 Mrs. Siteshwari Chandrakar <i>SC</i> 26/07/22
Specialist from Industry..... <i>D. S.</i>	5. Dr. Abhishek Kumar Misra <i>AKM</i>
	6. Dr. Kusumanjali Deshmukh <i>KD</i> 26/07/22

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

SYLLABUS FOR (2023-24)

M.Sc. (Physics) Semester- IV

Paper - VI

MPHL08: LAB-COURSE I - 8086 MICROPROCESSOR, ARDUINO and ExpEYES

Min. Marks: 34

Max. Marks: 100

Scheme of Marks:

Max. Marks: 100 marks

Expt : 60 marks

Sessional: 20 marks

Viva: 20 marks

List of Experiment

(i) 8086 MICROPROCESSOR

- 1 Write a program to add two 16 bit numbers.
- 2 Write a program to subtract two 16 bit numbers.
- 3 Write a program to multiply two 8 bit numbers.
- 4 Write a program to divide 16 bit number by 8 bit number.

(ii) Arduino Software

1. Experiment to glow the LED.
2. Measurement of the resistance of an unknown resistance.

(iii) ExpEYES Kit

- 1 Study of the V-I characteristics of diodes.
- 2 Study of the CE configuration of transistor.
- 3 Study of the half wave rectifier using PN junction.
- 4 Study of the full wave rectifier using PN junction.
- 5 Study of the clipping circuit using PN junction diode.
- 6 Study of the clamping using PN junction diode.
- 7 Study of OPAMP as inverting and non-inverting amplifier.
- 8 Study of logic gates.
or other experiments of equal standard

Name and Signature

V.C. Nominee	Departmental members
Subject Expert <i>26/7/22</i>	1. H.O.D Dr. Jagjeet Kaur Saluja <i>26/7/22</i>
Subject Expert.....	2. Dr. R. S. Singh <i>26/7/22</i>
Alumni (member).....	3. Dr. Anita Shukla <i>26/7/22</i>
Prof. from other Dept. of Sc. Faculty <i>26/7/22</i>	4 Mrs. Sitieshwari Chandrakar <i>26/7/22</i>
Specialist from Industry..... <i>26/7/22</i>	5. Dr. Abhishek Kumar Misra <i>26/7/22</i>
	6. Dr. Kusumanjali Deshmukh..... <i>26/7/22</i>