



# UNIVERSITY OF JAMMU

(NAAC ACCREDITED 'A' GRADE' UNIVERSITY)  
Baba Sahib Ambedkar Road, Jammu-180006 (J&K)

Academic Section

Email: [academicsectionju14@gmail.com](mailto:academicsectionju14@gmail.com)

## NOTIFICATION

(23/June/Adp./44)

It is hereby notified for the information of all concerned that the Vice-Chancellor, in anticipation of the approval of the Academic Council, is pleased to authorize the adoption of the Syllabi and Courses of Studies in the subject of **Physics of Semester IIIrd and IVth for Four Year Under Graduate Programme (FYUGP) under the Choice Based Credit System** as per **NEP-2020 (as given in the annexure)** for the examinations to be held in the years as per the details given below:

Subject	Semester	For the examinations to be held in the year
Physics	Semester-III Semester-IV	December 2023, 2024 and 2025 May 2024, 2025 and 2026

The Syllabi of the courses is also available on the University website: [www.jammuuniversity.ac.in](http://www.jammuuniversity.ac.in).

Sd/-

DEAN ACADEMIC AFFAIRS

No. F. Acd/II/23/4838-4877

Dated: 12-6-2023

Copy for information and necessary action to:

1. Dean Faculty of Science
2. HOD/Convener, Board of Studies Physics
3. All members of the Board of Studies
4. C.A. to the Controller of Examinations
5. Director, Computer Centre, University of Jammu
6. Deputy Registrar/Asst. Registrar (Conf. /Exams. UG )
- ✓ 7. Incharge University Website for necessary action please

*Sumita Sharma*  
Deputy Registrar (Academic)  
12/6/23

*AS* 12/6/23  
*AS* 12/6  
*H* 12/6/23

**UNIVERSITY OF JAMMU**

**SYLLABII OF PHYSICS FOR FOUR YEAR UNDERGRADUATE  
PROGRAMME (FYUGP) UNDER CBCS AS PER NEP-2020  
W.E.F.ACADEMIC SESSION 2023**

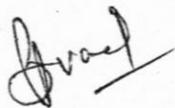
List of Major, Minor, Multi-disciplinary and Skill Enhancement Courses in Physics for 3rd semester and Major, Minor Courses for 4<sup>th</sup> Semester of FYUGP (Four Year Undergraduate Program) as per NEP-2020

**SEMESTER-III**

S. No	Course Type	Course No.	Course Title	Credits	Marks				Total Marks
					Theory		Practical / Tutorial		
					Mid Semester	End Semester	Assessment	Exam	
1.	Major	UMJPYT301	Electronics-I	3Th+1P	15	60	10	15	100
2.	Major	UMJPYT302	Heat and Thermodynamics	3Th+1T	15	60	10	15	100
3.	Minor	UMIPYT303	Basic Electronics	3Th+1P	15	60	10	15	100
4.	Multi-disciplinary	UMDPYT304	Fundamentals of Modern Physics	3Th	15	60	-----	-----	75
5.	Skill Enhancement	USEPYT305	Photography and video –audiography	2	25	25	-----	-----	50

**SEMESTER-IV**

S. No	Course Type	Course No.	Course Title	Credits	Marks				Total Marks
					Theory		Practical / Tutorial		
					Mid Semester	End Semester	Assessment	Exam	
1.	Major	UMJPYT401	Electronics-II	3Th+1P	15	60	10	15	100
2.	Major	UMJPYT402	Mathematical Physics-I	3Th+1T	15	60	10	15	100
3.	Major	UMJPYT403	Atomic Physics	3Th+1T	15	60	10	15	100
4.	Major	UMJPYT404	Waves and Optics	3Th+1P	15	60	10	15	100
5.	Minor	UMIPYT405	Optics	3Th+1P	15	60	10	15	100



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 3<sup>RD</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN DECEMBER 2023, 2024, 2025

B.Sc.- Physics			
<b>Semester:</b>	III	<b>Type:</b>	Major
<b>Course Name:</b>	Electronics-I	<b>Course Code:</b>	UMJPYT301
<b>Credits:</b>	4	<b>L T P:</b>	3-0-1
<b>Contact Hours</b>	45 (Theory) + 30 (Practicals)	<b>Academic Session</b>	
<b>Duration of Exam</b>	3 Hours (Theory) 2 ½ Hours (Practicals)		
<b>For Theory :</b> End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		<b>For Practicals :</b> Final Exam : 15 Marks Continuous Assessment: 10 Marks	

#### Syllabus for Theory (3 Credits)

*Note: The Mid Semester Examination shall be conducted after completing 50% of Syllabus.*

#### **Course learning outcomes:**

After completing this course content, student will be able to understand:

- Basic components and Circuit analysis
- Basics of Semiconductors and semiconductor diode as device and its applications

#### **Unit-I**

#### **Basic concepts and components:**

Concepts of electrical signal: analog, digital and their graphical and mathematical representation; signal sources: independent sources (voltage and current sources), dependent sources; discrete and integrated circuits, Circuit components: Resistors, Inductors and Capacitors (purpose in the electrical circuit, materials, and equivalent circuit) potentiometers.

#### **Unit-II**

**Networks and theorems:** DC and AC Circuit analysis of RC, RL circuits and RLC series and resonant circuits. (DC Transient analysis: RC Circuit- charging and discharging with initial charge, RL circuit with initial charge, Time constant, DC response of series RLC circuits; AC circuit analysis: LCR circuits- series and parallel resonance, condition of resonance, resonant frequency, bandwidth and Q- factor.)

Circuit Analysis: Superposition, Thevenin's, Norton's Maximum power transfer and Reciprocity theorems, Kirchhoff's Laws (KCL and KVL). Node analysis, Mesh analysis.



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 3<sup>RD</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN DECEMBER 2023, 2024, 2025

B.Sc.- Physics			
Semester:	III	Type:	Major
Course Name:	Electronics-I	Course Code:	UMJPYT301
Credits:	4	L T P:	3-0-1
Contact Hours	45 (Theory) + 30 (Practicals)	Academic Session	
Duration of Exam	3 Hours (Theory) 2 ½ Hours (Practicals)		
For Theory : End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		For Practicals : Final Exam : 15 Marks Continuous Assessment: 10 Marks	

#### Unit-III

##### **Fundamentals of Semiconductors:**

Energy levels of electrons in isolated atom, concept of energy bands in insulators, metals and semiconductors, electrical properties of semiconductors, intrinsic and extrinsic semiconductors, direct and indirect band gap semiconductors, qualitative idea of Fermi level, forbidden energy gap, free electron and holes, Energy band diagram in case of extrinsic semiconductors, mass action law, intrinsic carrier densities, Transport phenomenon in semiconductors, mobility and conductivity. Drift and diffusion currents

#### Unit-IV

##### **Semiconductor pn-junction:**

Junction diode – PN Junction (unbiased and biased). Formation of depletion layer in forward and reverse biased diode, Diode current equation, temperature effect on V-I characteristics of PN Junction. Application of diode as a switch, Rectifier, Types of rectifier and its applications (HWR and FWR): Ripple factor and efficiency of Rectifiers, avalanche and zener breakdown.

Special diodes: Zener diode, V-I characteristics and its application as voltage regulator, construction and working of: LED, LASER diode, Photodiode, Solar cell.



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 3<sup>RD</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN DECEMBER 2023, 2024, 2025

B.Sc.- Physics			
<b>Semester:</b>	III	<b>Type:</b>	Major
<b>Course Name:</b>	Electronics-I	<b>Course Code:</b>	UMJPYT301
<b>Credits:</b>	4	<b>L T P:</b>	3-0-1
<b>Contact Hours</b>	45 (Theory) + 30 (Practicals)	<b>Academic Session</b>	
<b>Duration of Exam</b>	3 Hours (Theory) 2 ½ Hours (Practicals)		
<b>For Theory :</b> End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		<b>For Practicals :</b> Final Exam : 15 Marks Continuous Assessment: 10 Marks	

***Note for paper setters for End Semester Examination:***

The question paper will be of 60 marks. There shall be 2 sections in the question paper with pattern as follows:

Section A shall comprise of 4 short answer type questions (of 3 marks each) with one question from each unit. The students have to attempt all the questions from Section A.

Section B shall comprise of a total of 8 questions with two questions selected from each unit. Each question shall be of 12 marks. The students have to attempt 4 questions by selecting only one question from each unit.

The numerical problems should not exceed more than 20% of the maximum marks.

***Note for paper setters for Mid Semester Examination:***

The Mid Semester Examination shall be conducted by the course coordinator after completion of 50% of the syllabus.

The question paper will be of 15 marks. There shall be 2 sections in the question paper with pattern as follows:

Section-A shall comprise of 3 questions (of 4 marks each) and the students are required to attempt any two questions.

Section-B shall comprise of 2 questions (of 7 marks each) and the students are required to attempt any one question.



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 3<sup>RD</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN DECEMBER 2023, 2024, 2025

B.Sc.- Physics			
Semester:	III	Type:	Major
Course Name:	Electronics-I	Course Code:	UMJPYT301
Credits:	4	L T P:	3-0-1
Contact Hours	45 (Theory) + 30 (Practicals)	Academic Session	
Duration of Exam	3 Hours (Theory) 2 ½ Hours (Practicals)		
For Theory : End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		For Practicals : Final Exam : 15 Marks Continuous Assessment: 10 Marks	

#### Text and Reference Books

1. S.M Sze, Semiconductor devices: Physics and technology, 2<sup>nd</sup> edition , Wiley India edition (2002)
2. Jasprit Singh, Semiconductor devices: Basic principles, John Wiley and Son (2001)
3. Basic Electronics by Albert Malvino David Bates and A.B Patil
4. S.A Nasar, Electric Circuits , Schaum's outline series Tata MacGraw Hill(2004)
5. S.N Ali, Basic Electronics, 2<sup>nd</sup> edition
6. B.G. Streetman, S.K. Banerjee, "Solid state Electronic Devices", Pearson Education India, 2015, 7<sup>th</sup> ed.
7. J.D. Ryder, "Electronic Fundamentals and Applications", Prentice-Hall Of India Pvt. Ltd, 1975, 5<sup>th</sup> ed.

#### Syllabus for Practicals(C.No.UMJPYT301)

**Note:** Perform any 05 of the following experiments as per availability of the apparatus

#### List of experiments:

1. Study of V-I characteristics of pn junction diode.
2. Study of V-I characteristics of zener diode.
3. Study of Ripple factor of HWR and FWR with and without filters.
4. Study of transistor characteristics in CB configuration.
5. Study of transistor characteristics in CE configuration.
6. Study of zener diode as voltage regulator.
7. Verification of Thevenin's theorem and Maximum Power Transfer Theorem.
8. Verification of superposition theorem.

**Pattern of Exam for Practicals:** Continuous Assessment: 10marks

Final Examination (To be conducted by the course Coordinator internally) :15marks



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 3<sup>RD</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN DECEMBER 2023, 2024, 2025

B.Sc.- Physics			
Semester:	III	Type:	Major
Course Name:	Heat and Thermodynamics	Course Code:	UMJPYT302
Credits:	4	L T P:	3-1-0
Contact Hours	45 (Theory) + 15 (Tutorial)	Academic Session	
Duration of Exam	3 Hours (Theory) 1 Hour (Tutorials)		
For Theory : End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		For Tutorials : Final Exam : 15 Marks Continuous Assessment: 10 Marks	

#### Syllabus for Theory (3 Credits)

*Note: The Mid Semester Examination Shall be conducted after completing 50% of Syllabus.*

#### Course learning outcomes:

After completing this course content, student will be able to understand:

- Basic concepts of Thermodynamics
- Basic concepts of Entropy
- Basic concepts of Heat Transfer Mechanisms
- Basic concepts of Temperature Scales

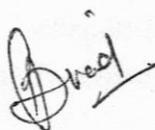
#### Unit-I

**Concepts of Thermodynamics :** Thermodynamic state of a system and zeroth law of thermodynamics, thermodynamic equilibrium, adiabatic and isothermal changes, work done during isothermal changes, adiabatic relations for perfect gas, work done during adiabatic change, indicator diagram, first law of thermodynamics, reversible and irreversible processes.

#### Unit-II

**Second law of thermodynamics:** Kelvin-Planck and Clausius statements and their equivalence, Carnot's theorem, thermodynamic scale of temperature and its identity with gas scale.

**Entropy:** Additive nature of entropy, Entropy changes in reversible and irreversible processes, Heat death of the universe, Impossibility of attaining absolute zero, Nernst heat theorem and Third law of thermodynamics. Temperature-entropy diagram,



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 3<sup>RD</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN DECEMBER 2023, 2024, 2025

B.Sc.- Physics			
<b>Semester:</b>	III	<b>Type:</b>	Major
<b>Course Name:</b>	Heat and Thermodynamics	<b>Course Code:</b>	UMJPYT302
<b>Credits:</b>	4	<b>L T P:</b>	3-1-0
<b>Contact Hours</b>	45 (Theory) + 15 (Tutorial)	<b>Academic Session</b>	
<b>Duration of Exam</b>	3 Hours (Theory) 1 Hour (Tutorials)		
<b>For Theory :</b> End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		<b>For Tutorials :</b> Final Exam : 15 Marks Continuous Assessment: 10 Marks	

#### Unit-III

**Heat Transfer Mechanisms:** Heat Engines (Carnot's cycle and Carnot's heat engine and its efficiency, Otto cycle and its efficiency, Diesel cycle and its efficiency), Refrigerators (General principle and coefficient of performance of refrigerator, The Carnot refrigerator, Simple structure of vapour compression refrigerator), Air conditioning: principle and its applications.

#### Unit-IV

**Maxwell's thermodynamic relations:** Intensive and extensive parameters, Thermodynamic potentials- Internal energy, Enthalpy, Helmholtz free energy and Gibb's free energy. Maxwell's thermodynamic relations. T-dS equations, Cooling due to Adiabatic Expansion of gas. Clausius-Clapeyron latent heat equations. Joule-Thomson effect and its mathematical treatment. Cooling due to adiabatic demagnetization and production of very low temperature by it.

***Note for paper setters for End Semester Examination:***

The question paper will be of 60 marks. There shall be 2 sections in the question paper with pattern as follows:

Section A shall comprise of 4 short answer type questions (of 3 marks each) with one question from each unit. The students have to attempt all the questions from Section A.

Section B shall comprise of a total of 8 questions with two questions selected from each unit. Each question shall be of 12 marks. The students have to attempt 4 questions by selecting only one question from each unit.

The numerical problems should not exceed more than 20% of the maximum marks.



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 3<sup>RD</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN DECEMBER 2023, 2024, 2025

B.Sc.- Physics			
Semester:	III	Type:	Major
Course Name:	Heat and Thermodynamics	Course Code:	UMJPYT302
Credits:	4	L T P:	3-1-0
Contact Hours	45 (Theory) + 15 (Tutorial)	Academic Session	
Duration of Exam	3 Hours (Theory) 1 Hour (Tutorials)		
For Theory : End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		For Tutorials : Final Exam : 15 Marks Continuous Assessment: 10 Marks	

***Note for paper setters for Mid Semester Examination:***

The Mid Semester Examination shall be conducted by the course coordinator after completion of 50% of the syllabus.

The question paper will be of 15 marks. There shall be 2 sections in the question paper with pattern as follows:

Section-A shall comprise of 3 questions (of 4 marks each) and the students are required to attempt any two questions.

Section-B shall comprise of 2 questions (of 7 marks each) and the students are required to attempt any one question.

**Text and Reference Books**

1. A Treatise on Heat, M.N. Saha, and B.N. Srivastava, 1973, Indian Press.
2. Thermodynamics, Enrico Fermi, 1956, Courier Dover Publications.
3. Heat and Thermodynamics, M.W.Zemasky and R. Dittman, 1981, McGraw Hill
4. Theory and experiment on Thermal Physics, P.K.Chakrabarti, New central Book Agency.
5. Thermal Physics, A. Kumar and S.P. Taneja, 2014, R. Chand and Co, New Delhi.
6. Thermal Physics, S. Garg, R. Bansal and C. Ghosh, 1993, Tata McGraw-Hill.



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 3<sup>RD</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN DECEMBER 2023, 2024, 2025

B.Sc.- Physics			
<b>Semester:</b>	III	<b>Type:</b>	Major
<b>Course Name:</b>	Heat and Thermodynamics	<b>Course Code:</b>	UMJPYT302
<b>Credits:</b>	4	<b>L T P:</b>	3-1-0
<b>Contact Hours</b>	45 (Theory) + 15 (Tutorial)	<b>Academic Session</b>	
<b>Duration of Exam</b>	3 Hours (Theory) 1 Hour (Tutorials)		
For Theory : End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		For Tutorials : Final Exam : 15 Marks Continuous Assessment: 10 Marks	

#### Syllabus for Tutorials (C.No.UMJPYT302)

**Equation of state:** Equations of state, Andrew's experiment, Amagat's experiment, Vander Waal's equation of state, critical constants, reduced equation of state, Joule-Thomson porous plug experiment. Temperature of Inversion, Critical Temperature and Boyle's Temperature

**Thermometry:** Temperature scales (Centigrade, Fahrenheit and Kelvin scale), principle, construction and working of following thermometers:

Liquid and gas thermometers, Resistive type thermometers, Thermocouple as thermometer, Pyrometers.

**Pattern of Exam for Tutorials:** Continuous Assessment: 10 marks

Final Examination (To be conducted by the course coordinator internally) : 15 marks



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 3<sup>RD</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN DECEMBER 2023, 2024, 2025

B.Sc.- Physics			
<b>Semester:</b>	III	<b>Type:</b>	Minor
<b>Course Name:</b>	Basic Electronics	<b>Course Code:</b>	UMIPYT303
<b>Credits:</b>	4	<b>L T P:</b>	3-0-1
<b>Contact Hours</b>	45 (Theory) + 30 (Practicals)	<b>Academic Session</b>	
<b>Duration of Exam</b>	3 Hours (Theory) 2 ½ Hours (Practicals)		
<b>For Theory :</b> End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		<b>For Practicals :</b> Final Exam : 15 Marks Continuous Assessment: 10 Marks	

#### Syllabus for Theory (3 Credits)

*Note: The Mid Semester Examination shall be conducted after completing 50% of Syllabus.*

#### **Course learning outcomes:**

After completing this course content, student will be able to understand:

- Introduction to basic electronic components and circuits.
- Semiconductors and its application

#### **Unit-I**

**Basic concepts and components:** Concepts of electrical signal: analog, digital and their graphical and mathematical representation; signal sources: independent sources (voltage and current sources), dependent sources; discrete and integrated circuits active and passive devices.

**Circuit components:** Resistors, Inductors and Capacitors (purpose in the electrical circuit, materials, equivalent circuit), potentiometers.

#### **Unit-II**

**Networks and theorems:** DC and AC Circuit analysis of RC, RL circuits and RLC series and resonant circuits. (DC Transient analysis: RC Circuit- charging and discharging with initial charge, RL circuit with initial charge, Time constant, DC response of series RLC circuits; AC circuit analysis: LCR circuits- series and parallel resonance, condition of resonance, resonant frequency, bandwidth and Q- factor.)



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 3<sup>RD</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN DECEMBER 2023, 2024, 2025

B.Sc.- Physics			
<b>Semester:</b>	III	<b>Type:</b>	Minor
<b>Course Name:</b>	Basic Electronics	<b>Course Code:</b>	UMIPYT303
<b>Credits:</b>	4	<b>L T P:</b>	3-0-1
<b>Contact Hours</b>	45 (Theory) + 30 (Practicals)	<b>Academic Session</b>	
<b>Duration of Exam</b>	3 Hours (Theory) 2 ½ Hours (Practicals)		
For Theory : End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		For Practicals : Final Exam : 15 Marks Continuous Assessment: 10 Marks	

#### Unit-III

##### Semiconductor Physics: Fundamentals

Energy levels of electrons in isolated atom, concept of: energy bands in insulators, metals and semiconductors, electrical properties of semiconductors, intrinsic and extrinsic semiconductors, direct and indirect band gap semiconductors, Fermi level, forbidden energy gap, free electron and holes, Energy band diagram in case of extrinsic semiconductors, mass action law, Junction diode – PN Junction (unbiased and biased). Diode current equation, pn junction diode as half wave and full wave rectifier.

#### Unit-IV

##### Semiconductor devices

Junction diode – avalanche and Zener breakdown, Zener diode, V-I characteristics and its application as voltage regulator, Special diodes: construction and working of: LED, LASER diode, Photodiode, Solar cell.

Bipolar junction diode: pnp and npn transistor, basic transistor action, transistor amplifier configurations (CB, CE, CC) output characteristics and their comparison, DC load line and Q-point.



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 3<sup>RD</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN DECEMBER 2023, 2024, 2025

B.Sc.- Physics			
<b>Semester:</b>	III	<b>Type:</b>	Minor
<b>Course Name:</b>	Basic Electronics	<b>Course Code:</b>	UMIPYT303
<b>Credits:</b>	4	<b>L T P:</b>	3-0-1
<b>Contact Hours</b>	45 (Theory) + 30 (Practicals)	<b>Academic Session</b>	
<b>Duration of Exam</b>	3 Hours (Theory) 2 ½ Hours (Practicals)		
For Theory : End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		For Practicals : Final Exam : 15 Marks Continuous Assessment: 10 Marks	

***Note for paper setters for End Semester Examination:***

The question paper will be of 60 marks. There shall be 2 sections in the question paper with pattern as follows:

Section A shall comprise of 4 short answer type questions (of 3 marks each) with one question from each unit. The students have to attempt all the questions from Section A.

Section B shall comprise of a total of 8 questions with two questions selected from each unit. Each question shall be of 12 marks. The students have to attempt 4 questions by selecting only one question from each unit.

The numerical problems should not exceed more than 20% of the maximum marks.

***Note for paper setters for Mid Semester Examination:***

The Mid Semester Examination shall be conducted by the course coordinator after completion of 50% of the syllabus.

The question paper will be of 15 marks. There shall be 2 sections in the question paper with pattern as follows:

Section-A shall comprise of 3 questions (of 4 marks each) and the students are required to attempt any two questions.

Section-B shall comprise of 2 questions (of 7 marks each) and the students are required to attempt any one question.



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 3<sup>RD</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN DECEMBER 2023, 2024, 2025

B.Sc.- Physics			
Semester:	III	Type:	Minor
Course Name:	Basic Electronics	Course Code:	UMIPYT303
Credits:	4	L T P:	3-0-1
Contact Hours	45 (Theory) + 30 (Practicals)	Academic Session	
Duration of Exam	3 Hours (Theory) 2 ½ Hours (Practicals)		
For Theory : End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		For Practicals : Final Exam : 15 Marks Continuous Assessment: 10 Marks	

#### Text and Reference Books

1. S.M Sze, Semiconductor devices: Physics and technology, 2<sup>nd</sup> edition, Wiley India edition (2002).
2. Jasprit Singh, Semiconductor devices: Basic principles, John Wiley and Son (2001).
3. Basic Electronics by Albert Malvino David Bates and A.B Patil.
4. S.A. Nasar, Electric Circuits, Schaum's outline series Tata MacGraw Hill(2004).
5. S.N Ali, Basic Electronics, 2<sup>nd</sup> edition.
6. B.G. Streetman, S.K. Banerjee, "Solid state Electronic Devices", Pearson Education India, 2015, 7<sup>th</sup> ed.
7. J.D. Ryder, "Electronic Fundamentals and Applications", Prentice-Hall Of India Pvt. Ltd, 1975, 5<sup>th</sup> ed.

#### Syllabus for Practicals (C.No.UMJPYT301)

**Note:** Perform any 05 of the following experiments as per availability of the apparatus

#### List of experiments:

1. Study of V-I characteristics of pn junction diode.
2. Study of V-I characteristics of zener diode.
3. Study of Ripple factor of HWR and FWR with and without filters.
4. Study of transistor characteristics in CB configuration.
5. Study of transistor characteristics in CE configuration.
6. Study of Zener diode as voltage regulator.
7. Verification of Thevenin's theorem and Maximum Power Transfer Theorem.
8. Verification of superposition theorem



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 3<sup>RD</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN DECEMBER 2023, 2024, 2025

B.Sc.- Physics			
<b>Semester:</b>	III	<b>Type:</b>	Minor
<b>Course Name:</b>	Basic Electronics	<b>Course Code:</b>	UMIPYT303
<b>Credits:</b>	4	<b>L T P:</b>	3-0-1
<b>Contact Hours</b>	45 (Theory) + 30 (Practicals)	<b>Academic Session</b>	
<b>Duration of Exam</b>	3 Hours (Theory) 2 ½ Hours (Practicals)		
For Theory : End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		For Practicals : Final Exam : 15 Marks Continuous Assessment: 10 Marks	

**Pattern of Exam for Practicals:** Continuous Assessment: 10marks

Final Examination (To be conducted by the course coordinator internally) :15marks

#### Suggested Books

1. B.Sc. Practical Physics by C.L Arora
2. Practical Physics by R.K Shukla
3. B.Sc. Practical Physics by Harnam Singh



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 3<sup>RD</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN DECEMBER 2023, 2024, 2025

B.Sc.- Physics			
Semester:	III	Type:	Multi-disciplinary
Course Name:	Fundamentals of Modern Physics	Course Code:	UMDPYT304
Credits:	3	L T P:	3-0-0
Contact Hours	45 (Theory)	Academic Session	
Duration of Exam	3 Hours		
For Theory : End Semester Exam : 60 Marks; Mid Term Exam: 15 Marks			

#### Syllabus for Theory (3 Credits)

*Note: The Mid Semester Examination shall be conducted after completing 50% of Syllabus.*

#### Course learning outcomes:

After completing this course content, student will be able to understand:

- outline the de-Broglie's theory of matter waves
- distinguish between phase velocity and group velocity in wave motion
- know about the electromagnetic spectrum, its properties and various regions
- wave properties like frequency, energy wavelength and their relationship,
- basic concepts of relativity
- how x-rays are produced and their production
- Cosmic rays and their properties like energy, composition, latitude and altitude effect
- Fundamental concepts of relativity
- Nuclear radiations, their characteristics, fission, fusion and radioactivity

#### Unit-I

##### Wave properties and electromagnetic spectrum

Inadequacy of classical Mechanics, Black Body radiations, concept of Planck's hypothesis, Matter waves, the de Broglie wavelength, phase velocity of de Broglie waves, group velocity, Heisenberg uncertainty principle

The electromagnetic spectrum and its classification, characteristics of em radiations, characteristics and applications of various regions of em spectrum

#### Unit-II

##### X-rays and Cosmic-rays

Discovery of X-rays, Production and characteristics of X-rays, Bragg's law, X-ray spectra, characteristics of x-ray spectrum, Moseley's law

Origin of cosmic rays, Introduction to primary and secondary cosmic rays, Latitude effect, altitude effect, cosmic ray showers, discovery of positron



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 3<sup>RD</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN DECEMBER 2023, 2024, 2025

B.Sc.- Physics			
Semester:	III	Type:	Multi-disciplinary
Course Name:	Fundamentals of Modern Physics	Course Code:	UMDPYT304
Credits:	3	L T P:	3-0-0
Contact Hours	45 (Theory)	Academic Session	
Duration of Exam	3 Hours		
For Theory : End Semester Exam : 60 Marks; Mid Term Exam: 15 Marks			

#### Unit-III

##### Relativity

Introduction to frame of reference, postulates of special theory of relativity, the Lorentz transformation equations (qualitative idea only), Length contraction, time dilation, relativistic mass, Mass energy equivalence (qualitative idea only) and its applications.

#### Unit-IV

##### Nuclei and Radioactivity

Rutherford model of atom, general properties of nuclei, Binding energy and nuclear stability, nuclear forces and properties, Radioactivity, Different types of nuclear radiations and their properties, half-life rule, carbon dating, nuclear fission and fusion, nuclear reactors.

#### *Note for paper setters for End Semester Examination:*

The question paper will be of 60 marks. There shall be 2 sections in the question paper with pattern as follows:

Section A shall comprise of 4 short answer type questions (of 3 marks each) with one question from each unit. The students have to attempt all the questions from Section A.

Section B shall comprise of a total of 8 questions with two questions selected from each unit. Each question shall be of 12 marks. The students have to attempt 4 questions by selecting only one question from each unit.

The numerical problems should not exceed more than 20% of the maximum marks.



***Note for paper setters for Mid Semester Examination:***

The Mid Semester Examination shall be conducted by the course coordinator after completion of 50% of the syllabus.

The question paper will be of 15 marks. There shall be 2 sections in the question paper with pattern as follows:

Section-A shall comprise of 3 questions (of 4 marks each) and the students are required to attempt any two questions.

Section-B shall comprise of 2 questions (of 7 marks each) and the students are required to attempt any one question.

**Text and Reference Books:**

1. Concepts of Modern Physics, Arthur Beiser, Shobhit Mahajan, S Rai Choudhary, 7<sup>th</sup> ed.
2. Modern Physics, R. Murugesan and Kiruthiga Sivaprasth
3. Modern Physics by Serway, Cenage Learning, 3<sup>rd</sup> ed.



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 3<sup>RD</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN DECEMBER 2023, 2024, 2025

<b>Semester:</b>	III	<b>Type:</b>	Skill Enhancement Course
<b>Course Name:</b>	Photography and video – audiography	<b>Course Code:</b>	USEPYT305
<b>Credits:</b>	2	<b>LTP:</b>	1-0-1
<b>Contact Hrs.</b>	30		
<b>Duration of Exam</b>	2½ Hours	<b>End Semester Exam</b>	<b>25 Marks</b>
		<b>Mid Semester Exam</b>	<b>25 Marks</b>

*Note: Mid Semester Exam shall be conducted after completing 50% of syllabus.*

#### **Course learning outcomes:**

- After completing this course content, student will be able to understand:
- basics of still photography
- basics of camera handling, technicalities of cameras, lenses
- fundamentals of Audio video recording
- How to do recoding of audio and video on Compact Discs etc.

#### **Unit-I**

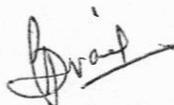
##### **Photography – Camera**

Camera – an introduction, part of a camera, camera eye (lens), shutters, special lens. Types of camera – their basic principle, constructions and working. Principle of video camera, choosing a camera, picture size. Choice of lens – angle of view and resolving power, aperture and focusing. Films, types of films, Film exposure, aperture and speed relationship, use of exposure meter, developing the exposed film.

#### **Unit-II**

##### **Audio – Video Recording**

Basic principle of recording (Inter-conversion), Methods of conversion of video signal into electrical signals, Methods of conversion of audio signal into electrical signals, Storage of audio – video signals on tapes, Quality of recording, sound recording on cine films, Tape characteristics, structure and composition, tape format, tape speeds, important tape parameters, Preservation of tapes, storage techniques, precaution, Over recording, need for over recording various methods of over – recording, protection of over–recording.



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 3<sup>RD</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN DECEMBER 2023, 2024, 2025

<b>Semester:</b>	III	<b>Type:</b>	Skill Enhancement Course
<b>Course Name:</b>	Photography and video – audiography	<b>Course Code:</b>	USEPYT305
<b>Credits:</b>	2	<b>LTP:</b>	1-0-1
<b>Contact Hrs.</b>	30		
<b>Duration of Exam</b>	2½Hours	<b>End Semester Exam</b>	25 Marks
		<b>Mid Semester Exam</b>	25 Marks

#### Unit-III

#### Compact Disc for Audio – Video Recording

Compact disc – limitation of traditional audio recording system, lamination video recording system, Need for compact disc, advantages of compact disc, CD for audio recording, Basic principle of audio recording, Construction of CD for audio, Methods of CD – audio –recording, Care and cautions, CD for video –recording, construction of CD for video, Basic principle for video recording, Methods of CD – video recording, General operating and installation precautions, CD – players, operating principle.

#### *Note for paper setters for End Semester Examination:*

The question paper will be of 25 marks. There shall be 2 sections in the question paper with pattern as follows:

Section A shall comprise of 4 short answer type questions (of 2½ marks each) with at least one question from each unit. The students have to attempt all questions from Section A.

Section B shall comprise of a total of 6 questions with two questions selected from each unit. Each question shall be of 5 marks. The students have to attempt 3 questions by selecting only one question from each unit.

#### **Text and Reference Books:**

1. Photography: Physics and Art in Focus by John Beaver.
2. The Science and Practice of Photography by John R. Roebuck.
3. Physics of Sound by Richard E. Berg, Pearson India.
4. The Physics of Optical Recording by Kurt Schwartz



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 4<sup>TH</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN MAY 2024, 2025, 2026

B.Sc.- Physics			
<b>Semester:</b>	IV	<b>Type:</b>	Major
<b>Course Name:</b>	Electronics-II	<b>Course Code:</b>	UMJPYT401
<b>Credits:</b>	4	<b>L T P:</b>	3-0-1
<b>Contact Hours</b>	45 (Theory) + 30 (Practicals)	<b>Academic Session</b>	
<b>Duration of Exam</b>	3 Hours (Theory) 2 ½ Hours (Practicals)		
<b>For Theory :</b> End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		<b>For Practicals :</b> Final Exam : 15 Marks Continuous Assessment: 10 Marks	

#### Syllabus for Theory (3 Credits)

*Note: The Mid Semester Examination Shall be conducted after completing 50% of Syllabus.*

#### **Course learning outcomes:**

After completing this course content, student will be able to understand:

- Basic components and Circuit analysis
- Basics of Semiconductors and semiconductor diode as device and its applications

#### Unit-I

##### **Transistors :**

**Bipolar Junction Transistor (BJT)**, PNP and NPN transistor, Basic Transistor action, study of CB, CE and CC configurations of transistor to study characteristics, active, cutoff and saturation regions, current gain and relation between them, DC load line analysis and Q-point stabilization

**Transistor biasing:** faithful amplification and need for biasing, stability factors and its calculation for transistor biasing circuits for CE configuration: fixed bias (base resistor method), emitter bias (fixed bias with emitter resistor), Collector to base bias (base bias with collector feedback) and voltage divider bias, discussion of emitter follower bias.

#### Unit-II

**Amplifiers:** Classification of amplifiers based on mode of operation (Class A, B, AB, C & D), stages (single & multi stage, cascade & cascade connections) Coupling methods (RC, transformer, direct and LC coupling). Nature of amplification (voltage and Power amplification)



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 4<sup>TH</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN MAY 2024, 2025, 2026

B.Sc.- Physics			
<b>Semester:</b>	IV	<b>Type:</b>	Major
<b>Course Name:</b>	Electronics-II	<b>Course Code:</b>	UMJPYT401
<b>Credits:</b>	4	<b>L T P:</b>	3-0-1
<b>Contact Hours</b>	45 (Theory) + 30 (Practicals)	<b>Academic Session</b>	
<b>Duration of Exam</b>	3 Hours (Theory) 2 ½ Hours (Practicals)		
<b>For Theory :</b> End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		<b>For Practicals :</b> Final Exam : 15 Marks Continuous Assessment: 10 Marks	

BJT as an amplifier in CE configuration, various amplification parameters, and qualitative discussion of RC coupled voltage amplifier, general principle of operation of small signal amplifiers, distortion in amplifiers, review of BJT equivalent circuit and hybrid parameters, gain and frequency response of R-C coupled amplifier

#### Unit-III

##### Feedback and Oscillator Circuits:

Feedback Circuit: types of feedback, effects of positive and negative feedback, Voltage series, voltage shunt, current series and current shunt feedback connection types and their use for specific amplifiers, estimation of input impedance, output impedance, gain and bandwidth for voltage series negative feedback

Oscillator Circuits: use of positive feedback for oscillator operation, Barkhausen criterion for self-sustained oscillations, Feedback factor and frequency of oscillation for RC phase shift oscillator and Wein Bridge oscillator, Qualitative discussion of relative network feedback oscillators (Tuned oscillator circuits): Hartley and Colpitt's oscillators.

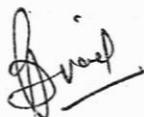
#### Unit-IV

##### Fundamentals of Digital Electronics:

**Number system-** decimal, binary, octal and hexadecimal number system and their inter conversion

**Binary codes:** BCD, Gray, ASCII & EBCDIC codes and their advantages and disadvantages.

**Binary arithmetic:** binary addition, binary subtraction using 1's and 2's compliment



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 4<sup>TH</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN MAY 2024, 2025, 2026

B.Sc.- Physics			
<b>Semester:</b>	IV	<b>Type:</b>	Major
<b>Course Name:</b>	Electronics-II	<b>Course Code:</b>	UMJPYT401
<b>Credits:</b>	4	<b>L T P:</b>	3-0-1
<b>Contact Hours</b>	45 (Theory) + 30 (Practicals)	<b>Academic Session</b>	
<b>Duration of Exam</b>	3 Hours (Theory) 2 ½ Hours (Practicals)		
<b>For Theory :</b> End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		<b>For Practicals :</b> Final Exam : 15 Marks Continuous Assessment: 10 Marks	

**Logic Gates-** Digital signal, clock pulse, OR, AND, NOT, NAND, NOR, X-OR, X-NOR, construction of OR, AND and NOT Gate from NAND and NOR gate. Boolean algebra, De-Morgan Laws of Boolean algebra.

***Note for paper setters for End Semester Examination:***

The question paper will be of 60 marks. There shall be 2 sections in the question paper with pattern as follows:

Section A shall comprise of 4 short answer type questions (of 3 marks each) with one question from each unit. The students have to attempt all the questions from Section A.

Section B shall comprise of a total of 8 questions with two questions selected from each unit. Each question shall be of 12 marks. The students have to attempt 4 questions by selecting only one question from each unit.

The numerical problems should not exceed more than 20% of the maximum marks.

***Note for paper setters for Mid Semester Examination:***

The Mid Semester Examination shall be conducted by the course coordinator after completion of 50% of the syllabus.

The question paper will be of 15 marks. There shall be 2 sections in the question paper with pattern as follows:

Section-A shall comprise of 3 questions (of 4 marks each) and the students are required to attempt any two questions.

Section-B shall comprise of 2 questions (of 7 marks each) and the students are required to attempt any one question.

## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 4<sup>TH</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN MAY 2024, 2025, 2026

B.Sc.- Physics			
<b>Semester:</b>	IV	<b>Type:</b>	Major
<b>Course Name:</b>	Electronics-II	<b>Course Code:</b>	UMJPYT401
<b>Credits:</b>	4	<b>L T P:</b>	3-0-1
<b>Contact Hours</b>	45 (Theory) + 30 (Practicals)	<b>Academic Session</b>	
<b>Duration of Exam</b>	3 Hours (Theory) 2 ½ Hours (Practicals)		
<b>For Theory :</b> End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		<b>For Practicals :</b> Final Exam : 15 Marks Continuous Assessment: 10 Marks	

#### **Text and Reference Books**

1. Electronics, Circuits and Analysis by Dinesh C. Dube, narosa Publications
2. Analog Electronics by L.K. Maheshwari and M.M.S. Anand , PHI Learning Pvt Ltd
3. Digital Electronics by G.K. Kharate , Oxford University Press
4. Handbook of electronics, S.L. Gupta and V. Kumar, PragatiPrakashan, Meerut, 2016, 3<sup>rd</sup> ed.
5. Integrated Electronics, J. Millman and C.C. Halkias (Tata McGraw Hill)
6. Digital Principles and Applications, A.P. Malvino, D.P. Leach & Saha (Tata McGraw Hill)
7. Semiconductor devices: Physics and technology, S.M Sze, Wiley India edition (2002)
8. Semiconductor devices: Basic principles, Jaspritsingh,, John Wiley and Son (2001)
9. Basic Electronics by Albert Malvino David Bates and A.B Patil
10. Electric Circuits, S.A Nasar, Schaum's outline series Tata MacGraw Hill(2004)

#### Syllabus for Practicals (C.No.UMJPYT301)

**Note :** Perform any 05 of the following experiments as per availability of the apparatus

#### **List of experiments :**

1. Study of half wave and full wave rectifier
2. Study of zener diode as voltage regulator
3. Study of single stage CE amplifier (determination of h -parameters)
4. Study of series-parallel resonance circuits
5. Verification of Truth tables of OR, AND, NOT, NAND, NOR, XOR and XNOR gates
6. Universal properties of NAND and NOR gates
7. Design of and study of Wien Bridge and RC phase shift Oscillator
8. Study of Colpitt's and crystal Oscillator using transistor

**Pattern of Exam for Practicals:** Continuous Assessment: 10 marks

Final Examination (To be conducted by the course coordinator internally) : 15 marks



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 4<sup>TH</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN MAY 2024, 2025, 2026

B.Sc.- Physics			
<b>Semester:</b>	IV	<b>Type:</b>	Major
<b>Course Name:</b>	Mathematical Physics-I	<b>Course Code:</b>	UMJPYT402
<b>Credits:</b>	4	<b>L T P:</b>	3-1-0
<b>Contact Hours</b>	45 (Theory) + 15 (Tutorial)	<b>Academic Session</b>	
<b>Duration of Exam</b>	3 Hours (Theory) 1 Hour (Tutorials)		
<b>For Theory :</b> End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		<b>For Tutorials :</b> Final Exam : 15 Marks Continuous Assessment: 10 Marks	

#### Syllabus for Theory (3 Credits)

*Note: The Mid Semester Examination shall be conducted after completing 50% of Syllabus.*

#### **Course learning outcomes:**

After completing this course content, student will be able to understand:  
Applications of Complex Numbers, Vectors and Matrices for application in Physics.

#### **Unit-I**

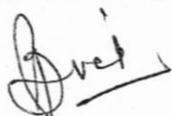
**Complex Numbers :** Introduction, Algebra of Complex Numbers, Argand diagram, Algebra of Complex Numbers using Argand diagram, rectangular, polar and exponential forms of Complex Numbers, De-Moivre's theorem, trigonometric, hyperbolic and exponential functions, powers, roots and log of complex numbers, Application of complex numbers to determine velocity and acceleration in curved motion.

#### **Unit-II**

**Vectors:** Recapitulation of Vector Algebra, properties of vectors under rotations. Scalar product and its invariance under coordinate rotations. Linear Vector Space: Linear Independence of vectors and dimensions, Basis and expansion theorem. Representation of vectors.  
**Vector Integration:** Ordinary Integrals of Vectors. Multiple integrals, Jacobian. Notion of infinitesimal line, Green's Theorem, Green's Theorem in a plane, Helmholtz theorem.

#### **Unit-III**

**Matrices :** Review of Algebraic operations of Matrices, Types of Matrices – Square matrix, diagonal matrix, scalar matrix, unit matrix, row matrix and column matrix, null matrix, upper triangular matrix, lower triangular matrix, transpose of a matrix , properties of transpose of a matrix, conjugate of a matrix, conjugate transpose of a matrix, symmetric and antisymmetric matrices, Hermitian and Skew-Hermitian matrices



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 4<sup>TH</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN MAY 2024, 2025, 2026

B.Sc.- Physics			
<b>Semester:</b>	IV	<b>Type:</b>	Major
<b>Course Name:</b>	Mathematical Physics-I	<b>Course Code:</b>	UMJPYT402
<b>Credits:</b>	4	<b>L T P:</b>	3-1-0
<b>Contact Hours</b>	45 (Theory) + 15 (Tutorial)	<b>Academic Session</b>	
<b>Duration of Exam</b>	3 Hours (Theory) 1 Hour (Tutorials)		
<b>For Theory :</b> End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		<b>For Tutorials :</b> Final Exam : 15 Marks Continuous Assessment: 10 Marks	

#### Unit-IV

**Matrices :** Determinant of a matrix, co-factors of a determinant, minors of a matrix, Singular and non-singular matrices, adjoint of a matrix, invertible matrices, orthogonal matrices, unitary matrices, trace of a matrix, elementary operations and elementary matrices, equivalent matrices, rank of a matrix, vectors as matrices and vector space, solution of Linear equations (Homogeneous and Non-homogeneous).

*Note for paper setters for End Semester Examination:*

The question paper will be of 60 marks. There shall be 2 sections in the question paper with pattern as follows:

Section A shall comprise of 4 short answer type questions (of 3 marks each) with one question from each unit. The students have to attempt all the questions from Section A.

Section B shall comprise of a total of 8 questions with two questions selected from each unit. Each question shall be of 12 marks. The students have to attempt 4 questions by selecting only one question from each unit.

The numerical problems should not exceed more than 20% of the maximum marks.

*Note for paper setters for Mid Semester Examination:*

The Mid Semester Examination shall be conducted by the course coordinator after completion of 50% of the syllabus.

The question paper will be of 15 marks. There shall be 2 sections in the question paper with pattern as follows:

Section-A shall comprise of 3 questions (of 4 marks each) and the students are required to attempt any two questions.

Section-B shall comprise of 2 questions (of 7 marks each) and the students are required to attempt any one question.



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 4<sup>TH</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN MAY 2024, 2025, 2026

B.Sc.- Physics			
Semester:	IV	Type:	Major
Course Name:	Mathematical Physics-I	Course Code:	UMJPYT402
Credits:	4	L T P:	3-1-0
Contact Hours	45 (Theory) + 15 (Tutorial)	Academic Session	
Duration of Exam	3 Hours (Theory) 1 Hour (Tutorials)		
For Theory : End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		For Tutorials : Final Exam : 15 Marks Continuous Assessment: 10 Marks	

#### Text and Reference Books

1. Mathematical methods in the Physical Sciences, M. L. Boas, 2005, Wiley
2. Mathematical Physics by Satya Prakash (Sultan Chand & Sons)
3. Mathematical Methods for Physicists, G.B. Arfken, H.J. Weber, F.E. Harris, 2013, 7th edition., Elsevier
4. Essential Mathematical Methods, K.F. Riley and M.P. Hobson, 2011, Cambridge Univ. Press
5. Vector Analysis and an introduction to TENSOR ANALYSIS, S. Lip Schutz, D. Spellman, M. R. Spiegel, Schaum's Outline Series, Tata McGraw Hill Education Private Limited, 2009
6. Matrix Methods: An Introduction, R. Bronson, 1991, Academic Press
7. A Students Guide to Vectors and Tensors, D. Fleisch, 2012, Cambridge University Press

#### Syllabus for Tutorials (C.No. UMJPYT402)

#### Plotting of Graphs :

1. Use the rectangular coordinate system to
  - (a) plot points in a rectangular coordinate system
  - (b) identify points on a graph
2. Graphing linear equation
  - (a) Recognize the relation between the solution of an equation and its graph e.g., in equation  $y = -x + 4$ , find if (i) (0, 4) (ii) (-1, 3) (iii) (2, 2) (iv) (-2, 6) is a solution to the equation.
  - (b) determine if the points are on line ?
  - (c) Graph a linear equation by plotting points e.g.,  $y = 4x-3$ ,  $y = -3$ , etc.
3. Graph of vertical and horizontal lines like  $y = -2$ ,  $x = 3$  etc.



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 4<sup>TH</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN MAY 2024, 2025, 2026

B.Sc.- Physics			
<b>Semester:</b>	IV	<b>Type:</b>	Major
<b>Course Name:</b>	Mathematical Physics-I	<b>Course Code:</b>	UMJPYT402
<b>Credits:</b>	4	<b>L T P:</b>	3-1-0
<b>Contact Hours</b>	45 (Theory) + 15 (Tutorial)	<b>Academic Session</b>	
<b>Duration of Exam</b>	3 Hours (Theory) 1 Hour (Tutorials)		
For Theory : End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		For Tutorials : Final Exam : 15 Marks Continuous Assessment: 10 Marks	

#### 4. Graphing with intercepts

- (a) Identify the intercepts on a graph
- (b) Find the intercepts from an equation of a line e.g  $x + y = 5$ ,  $y = 3/4x - 12$ ,  $y = 3x$  etc.
- (c) Graph a line using intercepts e.g  $-x + 3y = 3$ ,  $x + y = -2$  etc.

#### 5. Choose a most convenient method to graph a line

##### Example exercise

In the followings, identify the most convenient method to graph each line

- (i)  $x = 5$  (ii)  $y = -3$  (iii)  $2x + y = 5$  (iv)  $x - y = 2$  (v)  $y = 1/2x + 2$  (vi)  $y = 3/4x - 1$

#### 6. Understand slope of a line

- Use Geoboards to model space
- Find the slope of a line from its graph
- Find slope of horizontal and vertical lines
- Use the slope formula to find the slope of a line between two points
- Graph a line at a given point and its slope

#### 7. From a given set of data, create a Pie graph.

#### 8. From a given set of data, create a bar graph and histograms.

#### 9. Exercises on reading errors

Example: Choose your textbook or some other hardcover book and measure its thickness. What is the reading error in this measurement? Repeat the measurement a few times at different places on the book. What is the estimated standard deviation of your measurement?

#### 10. Error in the mean

Exercises on understanding the error on the mean



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 4<sup>TH</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN MAY 2024, 2025, 2026

B.Sc.- Physics			
<b>Semester:</b>	IV	<b>Type:</b>	Major
<b>Course Name:</b>	Mathematical Physics-I	<b>Course Code:</b>	UMJPYT402
<b>Credits:</b>	4	<b>L T P:</b>	3-1-0
<b>Contact Hours</b>	45 (Theory) + 15 (Tutorial)	<b>Academic Session</b>	
<b>Duration of Exam</b>	3 Hours (Theory) 1 Hour (Tutorials)		
<b>For Theory :</b> End Semester Exam : 60 Marks Mid Term Exam: 15 Marks	<b>For Tutorials :</b> Final Exam : 15 Marks Continuous Assessment: 10 Marks		

Example: Determine the period of oscillation of a pendulum. Use the procedure to

- (i) Measure the time for 20 oscillations,  $t_{20}$ , and repeat the measurement 5 times
- (ii) Measure the time for 5 oscillations,  $t_5$  and repeat the measurement 20 times.

Assuming, reasonably that the error in the determination of the time for 20 oscillations is the same as the error in the determination of the time for 5 oscillations.

Calculate the error in the period for both procedures to determine, which will give the smallest error in the value of the period?

11. Use of error bars in the graphical data display.

**Pattern of Exam For Tutorials:** Continuous Assessment: 10 marks

**Final Examination (To be conducted by the course coordinator internally) : 15 marks**



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 4<sup>TH</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN MAY 2024, 2025, 2026

B.Sc.- Physics			
<b>Semester:</b>	IV	<b>Type:</b>	Major
<b>Course Name:</b>	Atomic Physics	<b>Course Code:</b>	UMJPYT403
<b>Credits:</b>	4	<b>L T P:</b>	3-1-0
<b>Contact Hours</b>	45 (Theory) + 15 (Tutorial)	<b>Academic Session</b>	
<b>Duration of Exam</b>	3 Hours (Theory) 1 Hour (Tutorials)		
<b>For Theory :</b> End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		<b>For Tutorials :</b> Final Exam : 15 Marks Continuous Assessment: 10 Marks	

#### Syllabus for Theory (3 Credits)

*Note: The Mid Semester Examination shall be conducted after completing 50% of Syllabus.*

#### **Course learning outcomes:**

After completing this course content, student will be able to understand: theories explaining the structure of atoms and the origin of the observed spectra, fine structure of hydrogen atom, different coupling schemes

#### Unit-I

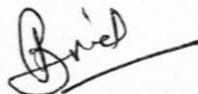
**Bohr's Theory and spectrum of Hydrogen Atom :** Production of spectra, types of spectra, wave number, spectrum of hydrogen atom and spectral series, observation of hydrogen spectrum, failure of electromagnetic theory of radiation, Bohr's theory and spectrum of hydrogen atom, characteristics of Bohr circular orbitals, explanation of spectral series in hydrogen spectrum, experimental confirmation of Bohr's theory, Franck-hertz experiment.

#### Unit-II

**Sommerfeld Theory of Hydrogen Atom :** The quantum conditions, Applications of quantization, quantization of elliptical orbits, Sommerfeld elliptical orbits, Relativistic correction to Sommerfeld elliptical orbits, Fine structure of H $\alpha$  line, Fine structure of He<sup>+</sup> line, selection rule for azimuthal quantum number.

#### Unit-III

**Vector Atom Model and Stern-Gerlach Experiment :** Space quantization, quantum numbers and their physical interpretation, Magnetic moments of an atom and Lande's g factor, Larmor's theorem, Stern-Gerlach Experiment, Fine structure of hydrogen lines, spectral terms and their notations,



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 4<sup>TH</sup> SEMESTER OF FYUP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN MAY 2024, 2025, 2026

B.Sc.- Physics			
<b>Semester:</b>	IV	<b>Type:</b>	Major
<b>Course Name:</b>	Atomic Physics	<b>Course Code:</b>	UMJPYT403
<b>Credits:</b>	4	<b>L T P:</b>	3-1-0
<b>Contact Hours</b>	45 (Theory) + 15 (Tutorial)	<b>Academic Session</b>	
<b>Duration of Exam</b>	3 Hours (Theory) 1 Hour (Tutorials)		
For Theory : End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		For Tutorials : Final Exam : 15 Marks Continuous Assessment: 10 Marks	

#### Unit-IV

**Spectra of Alkali and Alkaline Elements:** Different series in alkali spectra, Ritz combination principle, term values in alkali spectra and quantum defect, spin-orbit interaction, explanation of salient features of alkali spectra, doublet structure in alkali spectra, transition rules, intensity rules, spectra of alkaline earths, L-S coupling and jj coupling, selection rules in atoms of two valence electrons, singlet and triplet series in two valence electron systems.

**Note for paper setters for End Semester Examination:**

The question paper will be of 60 marks. There shall be 2 sections in the question paper with pattern as follows:

Section A shall comprise of 4 short answer type questions (of 3 marks each) with one question from each unit. The students have to attempt all the questions from Section A.

Section B shall comprise of a total of 8 questions with two questions selected from each unit. Each question shall be of 12 marks. The students have to attempt 4 questions by selecting only one question from each unit.

The numerical problems should not exceed more than 20% of the maximum marks.



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 4<sup>TH</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN MAY 2024, 2025, 2026

B.Sc.- Physics			
<b>Semester:</b>	IV	<b>Type:</b>	Major
<b>Course Name:</b>	Atomic Physics	<b>Course Code:</b>	UMJPYT403
<b>Credits:</b>	4	<b>L T P:</b>	3-1-0
<b>Contact Hours</b>	45 (Theory) + 15 (Tutorial)	<b>Academic Session</b>	
<b>Duration of Exam</b>	3 Hours (Theory) 1 Hour (Tutorials)		
<b>For Theory :</b> End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		<b>For Tutorials :</b> Final Exam : 15 Marks Continuous Assessment: 10 Marks	

#### *Note for paper setters for Mid Semester Examination:*

The Mid Semester Examination shall be conducted by the course coordinator after completion of 50% of the syllabus.

The question paper will be of 15 marks. There shall be 2 sections in the question paper with pattern as follows:

Section-A shall comprise of 3 questions (of 4 marks each) and the students are required to attempt any two questions.

Section-B shall comprise of 2 questions (of 7 marks each) and the students are required to attempt any one question.

#### **Text and Reference Books**

1. Elements of Spectroscopy by Gupta, Kumar, Sharma (A Pragati Edition).
2. Atomic and Molecular Spectroscopy by Mool Chand Gupta, New Age International publishers

#### Syllabus for Tutorials (C.No.UMJPYT403)

1. Calculations on energy of electron present in different orbits in hydrogen atom and radii of different orbits.
2. Idea about the ionization potential of atoms.

Example:

- (a) Ionisation potential of H-atom
- (b) Ionisation energy of hydrogen if the shortest wavelength in Balmer series is 3650 Å.
- (c) Ionisation potential of H-atom if wavelength of second line of Balmer series is 4861 Å.



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 4<sup>TH</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN MAY 2024, 2025, 2026

B.Sc.- Physics			
<b>Semester:</b>	IV	<b>Type:</b>	Major
<b>Course Name:</b>	Atomic Physics	<b>Course Code:</b>	UMJPYT403
<b>Credits:</b>	4	<b>L T P:</b>	3-1-0
<b>Contact Hours</b>	45 (Theory) + 15 (Tutorial)	<b>Academic Session</b>	
<b>Duration of Exam</b>	3 Hours (Theory) 1 Hour (Tutorials)		
<b>For Theory :</b> End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		<b>For Tutorials :</b> Final Exam : 15 Marks Continuous Assessment: 10 Marks	

3. Detailed knowledge about the possible orientations of spin vector  $S$  and orbital angular vector  $L$  with respect to magnetic field direction

Exercise:

- (a) Calculations of values of (i)  $l$ ,  $s$  and  $j$  and (ii)  $L$ ,  $S$  and  $J$  for a  $d$  electron in an one electron system
  - (b) For  $^2D_{5/2}$  state of the electron, calculate (i) possible values of  $m_j$  and  $J_z$  (ii) the different possible orientations of  $J$  vector in space. What are the possible orientations of  $S = 0$ .
4. Calculation of  $S$ ,  $L$  and  $J$  values that correspond to each of the following states

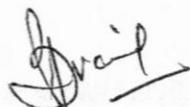
$$^1S_0, ^3P_2, ^2D_{3/2}, ^5F_5$$

5. Calculation of longest wavelength lines in the series  $(n, l) \rightarrow (4, 0)$  in potassium having wavelengths 7699, 7664.9, 4047.2 and 4041 Å, respectively.

6. Study of distinction between spectra of H and Na atoms. What makes the line spectra so different even though they belong to single valence electron system? How the doubling of levels in spectra of alkalis are explained?

**Pattern of Exam for Tutorials:** Continuous Assessment: 10 marks

Final Examination (To be conducted by the course coordinator internally) : 15 marks



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 4<sup>TH</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN MAY 2024, 2025, 2026

B.Sc.- Physics			
<b>Semester:</b>	IV	<b>Type:</b>	Major
<b>Course Name:</b>	Waves and Optics	<b>Course Code:</b>	UMJPYT404
<b>Credits:</b>	4	<b>L T P:</b>	3-0-1
<b>Contact Hours</b>	45 (Theory) + 30 (Practicals)	<b>Academic Session</b>	
<b>Duration of Exam</b>	3 Hours (Theory) 2 ½ Hours (Practicals)		
For Theory : End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		For Practicals : Final Exam : 15 Marks Continuous Assessment: 10 Marks	

#### Syllabus for Theory (3 Credits)

*Note: The Mid Semester Examination Shall be conducted after completing 50% of Syllabus.*

#### **Course learning outcomes:**

After completing this course content, student will be able to understand:

Nature of wave motion, physics behind various optical phenomena like interference, diffraction and polarisation

#### Unit-I

**Waves :** Wave equation in simple and differential form, general solution of wave equation , velocity of transverse waves in a string , velocity of longitudinal waves in a fluid , energy density and intensity of a progressive wave, phase and group velocity , characteristic impedance of a string, reflection and transmission coefficients, impedance matching. Superposition principle and linearity, stationary/standing waves on a string of fixed length, eigen functions, energy of a vibrating string, eigen frequencies.

#### Unit-II

**Interference :** Conditions for interference, Young's double slit experiment, theory of interference fringes, Fresnel's biprism and its application to the determination of wavelength of sodium light, Phase change on reflection , thin films (reflected and transmitted cases), Newton's Rings: determination of refractive index of liquid and wavelength of monochromatic light, Michelson's interferometer and its applications to determine (i) Wave length of monochromatic light (ii) thickness of thin transparent plate (iii) resolution of spectral lines (iv) Determination of refractive index of glass.



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 4<sup>TH</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN MAY 2024, 2025, 2026

B.Sc.- Physics			
<b>Semester:</b>	IV	<b>Type:</b>	Major
<b>Course Name:</b>	Waves and Optics	<b>Course Code:</b>	UMJPYT404
<b>Credits:</b>	4	<b>L T P:</b>	3-0-1
<b>Contact Hours</b>	45 (Theory) + 30 (Practicals)	<b>Academic Session</b>	
<b>Duration of Exam</b>	3 Hours (Theory) 2 ½ Hours (Practicals)		
<b>For Theory :</b> End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		<b>For Practicals :</b> Final Exam : 15 Marks Continuous Assessment: 10 Marks	

#### Unit-III

**Diffraction :** Fresnel's diffraction , Fresnel's half -period zones , rectilinear propagation of light , Zone plate action of Zone plate , Diffraction at a straight edge , rectangular slit and thin wire, Fraunhofer diffraction, single slit diffraction, two slit diffraction, plane transmission grating, determination of wavelength of monochromatic light using grating, width of principal maximum, absent spectra, dispersive power of grating, limit of resolution, Rayleigh's criterion, resolving power of grating.

#### Unit-IV

**Polarization :** Polarization by reflection, Brewster's law, Malus Law, phenomenon of double refraction, Huygen's theory of double refraction , Nicol prism, quarter wave plate and half wave plate; theory, production and detection of plane, circularly and elliptical polarized light, optical activity, specific rotation, Laurent's half shade polarimeter.

#### *Note for paper setters for End Semester Examination:*

The question paper will be of 60 marks. There shall be 2 sections in the question paper with pattern as follows:

Section A shall comprise of 4 short answer type questions (of 3 marks each) with one question from each unit. The students have to attempt all the questions from Section A.

Section B shall comprise of a total of 8 questions with two questions selected from each unit. Each question shall be of 12 marks. The students have to attempt 4 questions by selecting only one question from each unit.

The numerical problems should not exceed more than 20% of the maximum marks.



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 4<sup>TH</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN MAY 2024, 2025, 2026

B.Sc.- Physics			
<b>Semester:</b>	IV	<b>Type:</b>	Major
<b>Course Name:</b>	Waves and Optics	<b>Course Code:</b>	UMJPYT404
<b>Credits:</b>	4	<b>L T P:</b>	3-0-1
<b>Contact Hours</b>	45 (Theory) + 30 (Practicals)	<b>Academic Session</b>	
<b>Duration of Exam</b>	3 Hours (Theory) 2 ½ Hours (Practicals)		
<b>For Theory :</b> End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		<b>For Practicals :</b> Final Exam : 15 Marks Continuous Assessment: 10 Marks	

#### *Note for paper setters for Mid Semester Examination:*

The Mid Semester Examination shall be conducted by the course coordinator after completion of 50% of the syllabus.

The question paper will be of 15 marks. There shall be 2 sections in the question paper with pattern as follows:

Section-A shall comprise of 3 questions (of 4 marks each) and the students are required to attempt any two questions.

Section-B shall comprise of 2 questions (of 7 marks each) and the students are required to attempt any one question.

#### **Text and Reference Books**

1. Text Book of Vibrations and Waves, S.P.Puri (MacMillan India)
2. Physics of Vibrations and Waves, H.J.Pain (John Wiley, London)
3. Waves and Optics, K.K.Sharma (Sharma Publications)
4. Waves and Oscillations, N.Subrahmanyam & B.Lal (Vikas Publishers)
5. Fundamental of Optics, F.A.Jenkins and H,E.White (McGraw Hill)
6. Optics, Ajoy Ghatak (McMillan India)
7. Optics, Brijlal, Subrahmanyam and Avadhanulu (S.Chand & Co.)



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 4<sup>TH</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN MAY 2024, 2025, 2026

B.Sc.- Physics			
<b>Semester:</b>	IV	<b>Type:</b>	Major
<b>Course Name:</b>	Waves and Optics	<b>Course Code:</b>	UMJPYT404
<b>Credits:</b>	4	<b>L T P:</b>	3-0-1
<b>Contact Hours</b>	45 (Theory) + 30 (Practicals)	<b>Academic Session</b>	
<b>Duration of Exam</b>	3 Hours (Theory) 2 ½ Hours (Practicals)		
<b>For Theory :</b> End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		<b>For Practicals :</b> Final Exam : 15 Marks Continuous Assessment: 10 Marks	

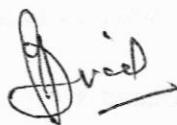
#### Syllabus for Practicals (C.No.UMJPYT404)

**Note:** Perform any 05 of the following experiments as per availability of the apparatus

#### **List of experiments:**

1. To find wavelength of sodium light by using Newton's rings.
2. To find specific rotation of sugar by using polarimeter.
3. To find values of Cauchy constants of material of a prism.
4. To find resolving power of a prism.
5. To find the refractive index of water using hollow prism.
6. To find the wavelength of sodium light using diffraction grating.
7. To find the dispersive power of material of given prism.

**Pattern of Exam for Practicals:** Continuous Assessment: 10 marks  
Final Examination (To be conducted by the course coordinator internally) : 15 marks



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 4<sup>TH</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN MAY 2024, 2025, 2026

B.Sc.- Physics			
<b>Semester:</b>	IV	<b>Type:</b>	Minor
<b>Course Name:</b>	Optics	<b>Course Code:</b>	UMIPYT405
<b>Credits:</b>	4	<b>L T P:</b>	3-0-1
<b>Contact Hours</b>	45 (Theory) + 30 (Practicals)	<b>Academic Session</b>	
<b>Duration of Exam</b>	3 Hours (Theory) 2 ½ Hours (Practicals)		
<b>For Theory :</b> End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		<b>For Practicals :</b> Final Exam : 15 Marks Continuous Assessment: 10 Marks	

#### Syllabus for Theory (3 Credits)

*Note: The Mid Semester Examination Shall be conducted after completing 50% of Syllabus.*

#### **Course learning outcomes:**

After completing this course content, student will be able to understand:

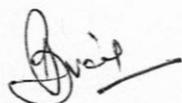
Concepts and terminology of geometrical optics, basic knowledge of interference, diffraction and polarization as a part of wave optics.

#### Unit-I

**Geometrical optics :** Fermat's principle, reflection and refraction at plane interface, Matrix formulation of geometrical Optics, Cardinal points and Cardinal planes of an optical system, Idea of dispersion, Application to thick Lens and thin Lens, Ramsden and Huygens eyepiece. Wave Optics: Electromagnetic nature of light. Definition and properties of wave front Huygens Principle. Temporal and Spatial Coherence.

#### Unit-II

**Interference :** Conditions for interference, Young's double slit experiment, theory of interference fringes, Fresnel's biprism and its application to the determination of wavelength of sodium light, Phase change on reflection, thin films (reflected and transmitted cases), Newton's Rings: determination of refractive index of liquid and wavelength of monochromatic light, Michelson's interferometer and its applications to determine (i) Wave length of monochromatic light (ii) thickness of thin transparent plate (iii) resolution of spectral lines (iv) Determination of refractive index of glass.



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 4<sup>TH</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN MAY 2024, 2025, 2026

B.Sc.- Physics			
<b>Semester:</b>	IV	<b>Type:</b>	Minor
<b>Course Name:</b>	Optics	<b>Course Code:</b>	UMIPYT405
<b>Credits:</b>	4	<b>L T P:</b>	3-0-1
<b>Contact Hours</b>	45 (Theory) + 30 (Practicals)	<b>Academic Session</b>	
<b>Duration of Exam</b>	3 Hours (Theory) 2 ½ Hours (Practicals)		
<b>For Theory :</b> End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		<b>For Practicals :</b> Final Exam : 15 Marks Continuous Assessment: 10 Marks	

#### Unit-III

**Diffraction :** Fresnel's diffraction , Fresnel's half -period zones , rectilinear propagation of light ,Zone plate action of Zone plate , Diffraction at a straight edge , rectangular slit and thin wire, Fraunhofer diffraction, single slit diffraction, two slit diffraction, plane transmission grating, determination of wavelength of monochromatic light using grating, width of principal maximum, absent spectra, dispersive power of grating, limit of resolution, Rayleigh's criterion, resolving power of grating.

#### Unit-IV

**Polarization :** Polarization by reflection, Brewster's law, Malus Law, phenomenon of double refraction, Huygen's theory of double refraction , Nicol prism, quarter wave plate and half wave plate; theory, production and detection of plane, circularly and elliptical polarized light, optical activity, specific rotation, Laurent's half shade polarimeter.



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 4<sup>TH</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN MAY 2024, 2025, 2026

B.Sc.- Physics			
<b>Semester:</b>	IV	<b>Type:</b>	Minor
<b>Course Name:</b>	Optics	<b>Course Code:</b>	UMIPYT405
<b>Credits:</b>	4	<b>L T P:</b>	3-0-1
<b>Contact Hours</b>	45 (Theory) + 30 (Practicals)	<b>Academic Session</b>	
<b>Duration of Exam</b>	3 Hours (Theory) 2 ½ Hours (Practicals)		
<b>For Theory :</b> End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		<b>For Practicals :</b> Final Exam : 15 Marks Continuous Assessment: 10 Marks	

***Note for paper setters for End Semester Examination:***

The question paper will be of 60 marks. There shall be 2 sections in the question paper with pattern as follows:

Section A shall comprise of 4 short answer type questions (of 3 marks each) with one question from each unit. The students have to attempt all the questions from Section A.

Section B shall comprise of a total of 8 questions with two questions selected from each unit. Each question shall be of 12 marks. The students have to attempt 4 questions by selecting only one question from each unit.

The numerical problems should not exceed more than 20% of the maximum marks.

***Note for paper setters for Mid Semester Examination:***

The Mid Semester Examination shall be conducted by the course coordinator after completion of 50% of the syllabus.

The question paper will be of 15 marks. There shall be 2 sections in the question paper with pattern as follows:

Section-A shall comprise of 3 questions (of 4 marks each) and the students are required to attempt any two questions.

Section-B shall comprise of 2 questions (of 7 marks each) and the students are required to attempt any one question.



## UNIVERSITY OF JAMMU

### SYLLABUS OF PHYSICS FOR 4<sup>TH</sup> SEMESTER OF FYUGP UNDER CBCS AS PER NEP-2020 FOR THE EXAMINATION TO BE HELD IN MAY 2024, 2025, 2026

B.Sc.- Physics			
Semester:	IV	Type:	Minor
Course Name:	Optics	Course Code:	UMIPYT405
Credits:	4	L T P:	3-0-1
Contact Hours	45 (Theory) + 30 (Practicals)	Academic Session	
Duration of Exam	3 Hours (Theory) 2 ½ Hours (Practicals)		
For Theory : End Semester Exam : 60 Marks Mid Term Exam: 15 Marks		For Practicals : Final Exam : 15 Marks Continuous Assessment: 10 Marks	

#### Text and Reference Books

1. Optics – B.K. Mathur
2. Principles of Optics-Max Born and Emil Wolf (Pergamon Press)Waves and Oscillations, N.Subrahmanyam & B. Lal (Vikas Publishers)
3. Fundamental of Optics, F.A. Jenkins and H,E.White (McGraw Hill)
4. Optics, Ajoy Ghatak (McMillan India)
5. Optics, Brijlal, Subrahmanyam and Avadhanulu (S.Chand & Co.)

#### Syllabus for Practicals (C.No. UMJPYT404)

**Note:** Perform any 05 of the following experiments as per availability of the apparatus

#### List of experiments:

1. To find wavelength of sodium light by using Newton's rings.
2. To find specific rotation of sugar by using polarimeter.
3. To find values of Cauchy constants of material of a prism.
4. To find resolving power of a prism.
5. To find the refractive index of water using hollow prism.
6. To find the wavelength of sodium light using diffraction grating.
7. To find the dispersive power of material of given prism.

**Pattern of Exam for Practicals:** Continuous Assessment: 10marks

Final Examination (To be conducted by the course coordinator internally) :15marks

