



પરિપત્ર:

ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટીની સાયન્સ વિદ્યાશાખાનાં અભ્યાસક્રમ ચલાવતી તમામ સંલગ્ન કોલેજોનાં આચાર્યશ્રીઓને સવિનય જણાવવાનું કે સાયન્સ વિદ્યાશાખા હેઠળનો NEP-૨૦૨૦ અંતર્ગતનો ફિઝીક્સ વિષયનો (બી.એસસી. (ફિઝીક્સ) વિથ ઓનર્સ) નો સેમેસ્ટર-૩ & સેમેસ્ટર-૪નો અભ્યાસક્રમ આ સાથે સામેલ છે.

માનનીય કુલપતિશ્રીની મંજૂરી અનુસાર સદર અભ્યાસક્રમ શૈક્ષણિક વર્ષ જુન, ૨૦૨૪ થી અમલવારી કરવાની રહે છે. સાયન્સ વિદ્યાશાખાનાં અભ્યાસક્રમ ચલાવતી તમામ સંલગ્ન કોલેજો ધ્વારા તેની અમલવારી કરવા જણાવવામાં આવે છે.

નોંધ: તા. ૦૩/૦૮/૨૦૨૪નાં પરીપત્રમાં ફક્ત સેમ-૦૩ MDC & સેમ-૦૪ MINOR કોર્સમાં ક્રેડીટ સ્ટ્રક્ચર અને તેની પેપર સ્ટાઈલ રિવાઈઝડ કરેલ છે.



[Signature]
૨૪/૦૮/૨૦૨૪
પ્રાસ ફરજ પરના અધિકારી
(એકેડેમિક)

ક્રમાંક/બીકેએનએમયુ/ એકેડેમિક/૧૪૧૮/૨૦૨૪

ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી,

સરકારી પોલીટેકનિક કેમ્પસ,

ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી રોડ,

ખડીયા, જૂનાગઢ-૩૬૨૨૬૩

તા.૨૪/૧૦/૨૦૨૪

પ્રતિ,

- ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી સંલગ્ન સાયન્સ વિદ્યાશાખાનાં અભ્યાસક્રમો ચલાવતી તમામ કોલેજોના આચાર્યશ્રીઓ તરફ....

નકલ સાદર રવાના:-

- માન.કુલપતિશ્રી/કુલસચિવશ્રીનાં અંગત સચિવશ્રી.
- પરીક્ષા નિયામકશ્રી, ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી, જૂનાગઢ

નકલ રવાના જાણ તથા યોગ્ય કાર્યવાહી અર્થે:

- સીસ્ટમ મેનેજરશ્રી, આઈ.ટી.સેલ વિભાગ (વેબસાઇટ ઉપર પ્રસિદ્ધ થવા અર્થે.)



BHAKTA KAVI NARSINH MEHTA UNIVERSITY JUNAGADH



BOARD OF **PHYSICS** STUDIES
FACULTY OF **SCIENCE**
SYLLABUS FOR
B.Sc. (PHYSICS) (HONOURS) PROGRAMME
(SEMESTER- III & IV)
EFFECTIVE FROM JUNE, 2024

BHAKTA KAVI NARSINH MEHTA UNIVERSITY
Syllabus of B.Sc. (Honors) as per NEP-2020
Faculty of Science
Effective from June 2024
Subject: Physics
SEMESTER-III& IV

SUMMARY OF THE SYLLABUS

Sem No.	Sr. No.	Category of Course	Course Title	Course Level	Credit	Teaching Hrs.	INTERNAL Marks	EXTERNAL Marks	Total Marks	External Exam Duration
Sem-3	1	Major-5	MAJPHY311	5.0	4	60	50	50	100	2:30 hours
	2	Major-6	MAJPHY312	5.0	4	60	50	50	100	2:30 hours
	3	Major-7	MAJPHY313 (P)	5.0	4	120	50	50	100	4 hours
	4	MDC-3	MDCPHY311 (T+P)	5.0	1 (Theory)	15	25	00	25	-
					3 (Practical)	90	25	50	75	4 hours
	5	SEC-3	SECPHY311 (P)	5.0	2	30	25	25	50	2 hours
				Total	18					

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Course Level	UG		Internal Marks	50
Programme	B.Sc in Physics		External Marks	50
Semester	III		Practical Internal	0
Category of Course	MAJOR		Practical External	0
Course Credit	4		Prac.External Exam Duration	0
Teaching Hours	60		Total	100
Course Code	MAJPHY311		Exam Duration	2:30 hours
Course Title	Fundamentals of Optical and Electronic Communications			

Course Objectives:

- The objective of this course is to equip students with foundational knowledge and skills in optical and electronic communication technologies. Students will gain an understanding of the principles and applications of fiber optics and lasers, explore the functionalities of single-stage transistor amplifiers, and learn the essential concepts and techniques of modulation and demodulation. This course aims to provide a comprehensive introduction to the technologies that underpin modern communication systems.

Course Learning Outcomes:

- Upon completion of the course, students should be able to:
- Explain the core principles of fiber optics and lasers, and demonstrate the ability to use these technologies.
- Understand the fundamental concepts of electronic amplification using single-stage transistor amplifiers, including their design, function, and role in enhancing signal integrity.
- Learn about various modulation and demodulation techniques
- Cultivate advanced analytical thinking abilities, essential for evaluating complex systems and contributing to innovations in communication technology.

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Unit No.	Syllabi	Teaching Hours
1	Fiber Optics 1. Introduction 2. Optical Fiber 3. Necessity of Cladding 4. Optical Fiber System 5. Optical Fiber Cable 6. Total internal reflection 7. Propagation of Light Through an Optical Fibre 8. Critical angle of propagation 9. Acceptance angle 10. Fractional Refractive Index Change 11. Numerical Aperture 12. Modes of Propagation 13. The three types of fibers 14. Medical & Military Applications 15. Merits and demerits of optical fibers 16. Related Numerical.	15
2	LASER 1. Introduction 2. Interaction of Light with matter (Absorption, Spontaneous emission, and, Stimulated emission) 3. Meeting the three Requirements (Population inversion, Metastable States, and Confining radiation within the medium) 4. Components of LASER (Active medium, Pumping Agent, Optical Resonator) 5. Three-level pumping scheme 6. Four-level pumping scheme 7. Types of LASERS (Ruby Laser, Nd-YAG Laser, Helium-Neon Laser), 8. LASER BEAM Characteristics 9. Applications 10. Related Numerical.	15
3	Single Stage Transistor Amplifier 1. Introduction 2. Single Stage Transistor Amplifier 3. How Transistors Amplifies 4. Practical Circuit of Transistor Amplifier 5. Phase Reversal 6. Load line Analysis 7. Voltage gain 8. Classification of Amplifiers 9. Amplifier Equivalent Circuit 10. Equivalent Circuit with Signal Source 11. Gain and Transistor Configurations 12. Related Numerical	15
4	Modulation And Demodulation 1. Introduction 2. Radio Broadcasting, Transmission, and Reception 3. Modulation and Need for Modulation 4. Types of Modulation 5. Amplitude Modulation 6. Modulation Factor 7. Analysis of Amplitude Modulated Wave 8. Sideband Frequencies in AM Wave 9. Limitations of Amplitude Modulation 10. Frequency Modulation 11. Theory of Frequency Modulation 12. Comparison between FM and AM 13. Demodulation or Detection 14. Essentials in Demodulation 15. AM Diode detector 16. AM Radio Receiver 17. Related Numerical.	15

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Suggested Reading:

Text Books:

1. A Text Book of Optics by N.Subrahmanyam, Brijlal & M.N. Avadhanulu, Publishers: S.Chand
2. Principles of Electronics by V.K.Mehta & Rohit Mehta, Publishers: S.Chand

Reference Books:

1. Modern Engineering Physics by A.S.Vasudeva, Publishers: S.Chand
2. Modern Physics by R. Murugesan & Kiruthinga Sivaprasath, Publishers: S.Chand
3. Fundamental of Electronics by D.C.Tayal, Praveen Tayal, Publishers: Himalaya Publishing House
4. Basic Electronics (Solid State) by B.L.Theraja, Publishers: S.Chand
5. Principles of Optics by Mathur & Pandya
6. Modern Electronics Instrumentation and Measurement Techniques by Albert D Helfrick & William D Cooper Publishers: PHI

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Course Level	UG		Internal Marks	50
Programme	B.Sc in Physics		External Marks	50
Semester	III		Practical Internal	0
Category of Course	MAJOR		Practical External	0
Course Credit	4		Prac.External Exam Duration	0
Teaching Hours	60		Total	100
Course Code	MAJPHY312		Exam Duration	2:30 hours
Course Title	Fundamentals of AC Electronics			

Course Objectives:

- The primary goal of this course is to provide students with a comprehensive understanding of alternating current (AC) principles and their applications in electronic circuits. Students will explore AC circuit theories, delve into various AC bridge configurations, study and explore sinusoidal oscillators, and gain proficiency in using electronic instruments viz. Multimeter, CRO.

Course Learning Outcomes:

- Upon completion of the course, students should be able to:
- Understand the AC circuit behavior and the ability to calculate and measure electrical quantities like impedance and power.
- Use AC bridges for precise measurements, generate stable AC signals using functional sinusoidal oscillators, and operate complex electronic instruments such as oscilloscopes and function generators effectively.
- Interpret data from electronic measurements to make informed decisions about circuit modifications and improvements.
- Apply analytical and problem-solving skills to troubleshoot and optimize AC electronic systems.

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Unit No.	Syllabi	Teaching Hours
1	AC Circuit 1. Introduction 2. Circuit Elements 3. Kirchhoff's Law 4. L-R Circuit 5. R-C Circuit 6. L-C Circuit 7. L-C-R Series Circuit with Resonance 8. L-C-R Parallel Circuit with Resonance 9. Power in AC Circuit 10. Choking Coil 11. Quality Factor of Resonant Circuit 12. Bandwidth of Resonant Circuit 13. Related Numerical.	15
2	AC Bridges 1. Wheatstone Bridge 2. Impedance Bridge 3. Maxwell's Impedance Bridge 4. Maxwell's LC Bridge 5. Owen's Bridge 6. De Sauty's Bridge 7. Wein's Bridge 8. Schering Bridge 9. Kohlraush's Bridge 10. Related Numerical	15
3	Oscillators 1. Introduction 2. Sinusoidal Oscillators 3. Types of Sinusoidal Oscillations 4. Oscillatory Circuit 5. Positive Feedback Amplifier Oscillator 6. Essentials of Transistor Oscillator 7. Barkhausen Criterion 8. Different Types of Transistor Oscillators 9. Tuned Collector Oscillator 10. Colpitt's Oscillator 11. Hartley Oscillator 12. Principle of Phase Shift Oscillators 13. Phase Shift Oscillator 14. Wein Bridge Oscillator 15. Limitations of LC and RC Oscillators 16. Related Numerical.	15
4	Electronic Instruments 1. Electronic Instruments 2. Multimeter 3. Multimeter as Voltmeter 4. Multimeter as Ammeter 5. Multimeter as Ohmmeter 6. Applications of Multimeter 7. Sensitivity of Multimeter 8. Merits and Demerits of Multimeter 9. Meter Protection 10. Cathode Ray Oscilloscope 11. Cathode Ray Tube 12. Deflection Sensitivity of CRT 13. Various Controls of CRO 14. Applications of CRO	15

Suggested Reading:

Text Books:

1. Electricity and Magnetism by D.C. Tayal Publisher: Himalaya Publishing House
2. Principles of Electronics by V.K.Mehta & Rohit Mehta, Publishers: S.Chand

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Reference Books:

1. Modern Engineering Physics by A.S.Vasudeva, Publishers: S.Chand
2. Modern Physics by R. Murugesan & Kiruthinga Sivaprasath, Publishers: S.Chand
3. Fundamental of Electronics by D.C.Tayal, Praveen Tayal, Publishers: Himalaya Publishing House
4. Basic Electronics (Solid State) by B.L.Theraja, Publishers: S.Chand
5. Modern Electronics Instrumentation and Measurement Techniques by Albert D Helfrick & William D Cooper Publishers: PHI

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SEMESTER-III & IV

Course Level	UG	Internal Marks	0
Programme	B.Sc in Physics	External Marks	0
Semester	III	Practical Internal	50
Category of Course	MAJOR	Practical External	50
Course Credit	4	Prac.External Exam Duration	4 hours
Teaching Hours	120	Total	100
Course Code	MAJPHY313	Exam Duration	4 hours
Course Title	Physics Practical		

Course Objectives:

- The objective of this course is to enhance students' understanding of fundamental and applied physics principles through rigorous experimental practice. Students will develop Proficiency in Experimental Techniques, and gain hands-on experience with a variety of laboratory equipment and techniques, improving precision and accuracy in measurements. Students will understand underlying physics concepts, and deepen their understanding of the theoretical concepts underpinning experiments in mechanics, electromagnetism, optics, and electronics.

Course Learning Outcomes:

- Upon completion of the course, students should be able to:
- Demonstrate Proficiency with Laboratory Instruments and skillfully operate a variety of scientific instruments and equipment to conduct experiments in mechanics, electromagnetism, optics, and electronics.
- Accurately measure physical quantities and analyze the precision and accuracy of experimental data.
- Utilize fundamental physics principles to explain experimental outcomes, showing an ability to apply theoretical knowledge to practical situations.
- Work effectively in teams to plan, execute, and evaluate experimental investigations, demonstrating strong interpersonal and collaborative skills.

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Subject: Physics
SEMESTER-III & IV

Unit	Syllabi	Teaching Hours
List of Experiments	Practical 1: To determine the moment of inertia of a flywheel. Practical 2: To study the Variation of the magnetic field of Solenoid (Stuart & gee Pattern) (distance constant and current constant). Practical 3: To determine the figure of merit and voltage sensitivity of the ballistic / spot galvanometer. Practical 4: To Study the Zener diode as voltage regulating characteristic (with constant load). Practical 5: To draw a load line and determine Q - Point for common emitter configuration. Practical 6: To Study the Characteristics of a Phototransistor and verify inverse square law. Practical 7: To Study series resonance L – C – R Circuit and determine resonance frequency and quality factor. Practical 8: To Study Parallel resonance L – C – R Circuit and determine resonance frequency and quality factor. Practical 9: To determine Young's modulus of material by Cantilever method. Practical 10: To determine Young's modulus of material by bending of beam. Practical 11: To determine the Viscosity of liquid by Searl's co-axial Cylinder. Practical 12: To determine the resolving power of the prism. Practical 13: To determine the resolving power of the telescope. Practical 14: To determine the refractive index of a liquid by using the liquid lens method. Practical 15: To determine the radius of curvature of a given lens and refractive index of glass using the optical lever method.	120

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	Practical 16: To Study frequency response and bandwidth of RC coupled amplifier. Practical 17: Experimental measurements by multi-meter (power supply, resistor, transistor, diode, and capacitor) Practical 18: To Study L – R and R – C Circuit. Practical 19: To determine the modulus of rigidity by Statistical method (Barton's apparatus). Practical 20: To determine the modulus of rigidity by Statistical method (Searl's apparatus)	
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Suggested Reading:

1. B.Sc. Practical Physics by C.L.Arora, Publishers: S.Chand.

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Subject: Physics
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Course Level	UG		Internal Marks	0
Programme	B.Sc in Physics		External Marks	0
Semester	III		Practical Internal	25
Category of Course	MDC		Practical External	50
Course Credit	3		Prac.External Exam Duration	4 hours
Teaching Hours	90		Total	50
Course Code	MDCPHY311 (Practical)		Exam Duration	4 hours
Course Title	Laser and Fiber Optics/ Fundamental Physics Practical			

Course Objectives:

- The objective of this course is to enhance students' understanding of fundamental and applied physics principles through rigorous experimental practice. Students will develop Proficiency in Experimental Techniques, and gain hands-on experience with a variety of laboratory equipment and techniques, improving precision and accuracy in measurements. Students will understand underlying physics concepts, and deepen their understanding of the theoretical concepts underpinning experiments in mechanics, electromagnetism, optics, and electronics.

Course Learning Outcomes:

- Upon completion of the course, students should be able to:
- Demonstrate Proficiency with Laboratory Instruments and skilfully operate a variety of scientific instruments and equipment to conduct experiments in mechanics, electromagnetism, optics, and electronics.
- Accurately measure physical quantities and analyze the precision and accuracy of experimental data.
- Utilize fundamental physics principles to explain experimental outcomes, showing an ability to apply theoretical knowledge to practical situations.
- Work effectively in teams to plan, execute, and evaluate experimental investigations, demonstrating strong interpersonal and collaborative skills

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Effective from June 2024
Subject: Physics
SEMESTER-III & IV

Unit	Syllabi	Teaching Hours
List of Experiments	Practical 1: To determine the moment of inertia of a flywheel. Practical 2: To study the Variation of the magnetic field of Solenoid (Stuart & gee Pattern) (distance constant and current constant). Practical 3: To determine the figure of merit and voltage sensitivity of the ballistic / spot galvanometer. Practical 4: To Study the Zener diode as voltage regulating characteristic (with constant load). Practical 5: To draw a load line and determine Q - Point for common emitter configuration. Practical 6: To Study the Characteristics of a Phototransistor and verify inverse square law. Practical 7: To Study series resonance L – C – R Circuit and determine resonance frequency and quality factor. Practical 8: To Study Parallel resonance L – C – R Circuit and determine resonance frequency and quality factor. Practical 9: To determine Young's modulus of material by Cantilever method. Practical 10: To determine Young's modulus of material by bending of beam.	90

Suggested Reading:

1. B.Sc. Practical Physics by C.L.Arora, Publishers: S.Chand.

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Course Level	UG		Internal Marks	25
Programme	B.Sc in Physics		External Marks	00
Semester	III		Practical Internal	00
Category of Course	MDC		Practical External	00
Course Credit	1		Prac.External Exam Duration	00
Teaching Hours			Total	25
Course Code	MDCPHY311 (Theory)		Exam Duration	-
Course Title	Laser and Fiber Optics/ Fundamental Physics Practical			

Course Objectives:

- The objective of this course is to provide students with foundational knowledge and practical skills in fiber optics and laser technologies. Students will learn the principles of light propagation, fiber types, and laser operations, including the various applications in medical and military fields. The course aims to prepare students for advanced studies or careers in optical technologies, with an emphasis on applying theoretical concepts through numerical problem-solving.

Course Learning Outcomes:

- Upon completion of the course, students should be able to:
- Understand the fundamental principles of light propagation in optical fibers, including total internal reflection, critical and acceptance angles, and numerical aperture.
- Identify different types of optical fibers and describe their specific applications, advantages, and disadvantages.
- Differentiate between various types of lasers like Ruby, Nd-YAG, and Helium-Neon, and articulate their characteristics and applications
- Evaluate the impact of optical technologies in real-world applications, demonstrating an understanding of their broader relevance and potential.

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Unit No.	Syllabi	Teaching Hours
1	Fiber Optics 1. Introduction 2. Optical Fiber 3. Necessity of Cladding 4. Optical Fiber System 5. Optical Fiber Cable 6. Total internal reflection 7. Propagation of Light Through an Optical Fibre 8. Critical angle of propagation 9. Acceptance angle 10. Fractional Refractive Index Change 11. Numerical Aperture 12. Modes of Propagation 13. The three types of fibers 14. Medical & Military Applications 15. Merits and demerits of optical fibers	7.5
2	LASER 1. Introduction 2. Interaction of Light with matter (Absorption, Spontaneous emission, and, Stimulated emission) 3. Meeting the three Requirements (Population inversion, Metastable States, and Confining radiation within the medium) 4. Components of LASER (Active medium, Pumping Agent, Optical Resonator) 5. Three-level pumping scheme 6. Four-level pumping scheme 7. Types of LASERS (Ruby Laser, Nd-YAG Laser, Helium-Neon Laser), 8. LASER BEAM Characteristics 9. Applications	7.5

Suggested Reading:

Text Books:

1. A Text Book of Optics by N.Subrahmanyam, Brijlal & M.N. Avadhanulu, Publishers: S.Chand

Reference Books:

1. Modern Engineering Physics by A.S.Vasudeva, Publishers: S.Chand
2. Modern Physics by R. Murugesan & Kiruthinga Sivaprasath, Publishers: S.Chand
3. Principles of Optics by Mathur & Pandya

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SEMESTER - IV

BHAKTA KAVI NARSINH MEHTA UNIVERSITYSyllabus of **B.Sc. (Honors)** as per NEP-2020Faculty of **Science**

Effective from June 2024

Subject: Physics**SEMESTER-III & IV****PHYSICS SYLLABUS SEM-4 SUMMARY OF THE SYLLABUS**

Sem No.	Sr. No.	Category of Course	Course Title	Course Level	Credit	Teaching Hrs.	INTERNAL Marks	EXTERNAL Marks	Total Marks	External Exam Duration
Sem-4	1	Major-8	MAJPHY411	5.0	4	60	50	50	100	2:30 hours
	2	Major-9	MAJPHY412	5.0	4	60	50	50	100	2:30 hours
	3	Major-10	MAJPHY413 (P)	5.0	4	120	50	50	100	4 hours
	4	Minor-3	MINPHY411 (T+P)	5.0	1(T)	15	25	00	25	0
					3 (P)	90	25	75	50	4 hours
	5	SEC-4	SECPHY411 (P)	5.0	2	30	25	25	50	2 hours
				Total	18					

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Subject: Physics
SEMESTER-III & IV

Course Level	UG		Internal Marks	50
Programme	B.Sc in Physics		External Marks	50
Semester	IV		Practical Internal	0
Category of Course	MAJOR		Practical External	0
Course Credit	4		Prac.External Exam Duration	0
Teaching Hours	60		Total	100
Course Code	MAJPHY411		Exam Duration	2:30 hours
Course Title	Fundamentals of Semiconductor Device			

Course Objectives:

- This course aims to provide a comprehensive understanding of special purpose diodes, gas-filled tubes, semiconductor devices, and digital circuits. Students will learn the operation, characteristics, and applications of various diodes, including LEDs, photodiodes, tunnel diodes, and varactor diodes. The course also covers gas conduction, cold-cathode and hot-cathode gas diodes, FETs, UJT's, and their importance. Additionally, students will explore digital circuits, number systems, logic gates, Boolean algebra, and practical applications in digital electronics.

Course Learning Outcomes:

- Upon completion of the course, students should be able to:
- Understand the principles, operation, and characteristics of various special purpose diodes including LEDs, photodiodes, tunnel diodes, and varactor diodes.
- Learn about gas-filled tubes, including cold-cathode and hot-cathode gas diodes, and their conduction mechanisms.
- Gain in-depth knowledge of Field Effect Transistors (FETs), including their types, construction, operation, and characteristics.
- Explain the basics of digital circuits, including analog and digital signals, number systems, and logic gates.

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Unit No.	Syllabi	Teaching Hours
1	Special Purpose Diodes 1. Light Emitting Diode (LED) 2. LED Voltage and Current 3. Advantages of LED 4. Multicolor LED 5. Applications of LED 6. Photo Diode 7. Operation and Characteristics of Photo Diode 8. Application of Photo diode 9. Tunnel Diode 10. Varactor Diode 11. Application of Varactor Diode 12. Shockley Diode 13. Related Numerical	15
2	Gas Filled Tubes 1. Gas-Filled Tubes 2. Conduction in a Gas 3. Cold-Cathode Gas Diode 4. Characteristics of Cold-Cathode Gas Diode 5. Applications of Glow-Tubes 6. Hot-Cathode Gas Diode 7. Thyatron 8. Applications of Thyatron	15
3	Semiconductor Devices 1. Solar Cell 2. Thermistor 3. Introduction of Field Effect transistor (FET) 4. Types of FET 5. Construction of Junction Field Effect Transistor (JFET) 6. Principle and Working of JFET 7. Schematic Symbol of JFET 8. Importance of JFET 9. Difference between JFET and Bipolar Transistor 10. Output Characteristics of JFET 11. Importance Terms of JFET 12. Advantages of JFET 13. Parameters and Relations among Parameters of JFET 14. Construction & Working of Uni Junction Transistor (UJT) 15. Equivalent circuit of UJT 16. Characteristics of UJT 17. Advantages of UJT 18. Application of UJT 19. Related Numerical	15
4	Digital Circuit 1. Introduction 2. Analog and Digital Signal 3. Introduction to Number Systems 4. Decimal to Binary and Binary to Decimal Conversion 5. Binary Coded Decimal Code 6. Logic Gates- AND, OR, NOT, NAND and NOR Gates 7. NAND and NOR Gate as a universal gate 8. Exclusive OR Gate 9. Encoders and decoders 10. Boolean Algebra and Theorems 11. De Morgan's Theorems 12. Simplification of Logic Circuit using Boolean Algebra 13. Advantages and Disadvantages of Digital Electronics 14. Related Numerical	15

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Suggested Reading:

Text Books:

1. Principles of Electronics by V.K.Mehta & Rohit Mehta, Publisher: S.Chand
2. Basic Electronics By B.L.Thereja Publisher: S.Chand

Reference Books:

1. Electronic Device And Circuits By Allen Mottershead, Publisher: PHI
2. Basic electronics and linear circuits By N N Bhargava, D C Kushreshtha, S C Gupta
Publisher: Technical Teachers Training Institute, Chandigarh.
3. Fundamental of Electronics by D.C.Tayal, Praveen Tayal, Publishers: Himalaya
Publishing House
4. Digital principles and applications by Malvino A.P. & Leach .D.P., publisher: Tata
McGraw Hill, 7th edition

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Course Level	UG		Internal Marks	50
Programme	B.Sc in Physics		External Marks	50
Semester	IV		Practical Internal	0
Category of Course	MAJOR		Practical External	0
Course Credit	4		Prac.External Exam Duration	0
Teaching Hours	60		Total	100
Course Code	MAJPHY412		Exam Duration	2:30 hours
Course Title	Fundamental Concepts of Thermodynamics			

Course Objectives:

- The course aims to provide a comprehensive understanding of the fundamental principles of thermodynamics, including the laws of thermodynamics, entropy, theory of radiation, and thermodynamic potentials. It covers key concepts such as thermal equilibrium, internal energy, heat engines, and various thermodynamic processes. Additionally, the course includes applications of these principles through related numerical problems, enhancing analytical skills and practical understanding of thermodynamic systems and their behaviours.

Course Learning Outcomes:

- Upon completion of the course, students should be able to:
- Understand and apply the laws of thermodynamics, analyse thermal equilibrium, calculate internal energy and heat in various processes, and solve related numerical problems.
- Explain entropy principles and their applications, comprehend the theory of radiation, and utilize thermodynamic potentials and Maxwell's relations.
- Apply these concepts to real-world thermodynamic systems and processes, enhancing their skills and practical understanding of thermodynamics.

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Course Contents: MAJPHY412

Unit No.	Syllabi	Teaching Hours
1	Laws of Thermodynamics 1. Thermodynamic System 2. Thermal equilibrium and Zeroth law of Thermodynamics 3. Thermodynamic Equilibrium 4. Internal energy 5. Concept of Heat 6. First law of Thermodynamics 7. Specific heat of the gas – Mayer’s formula 8. Various thermodynamics processes [only Definition] 9. Work done during isothermal and adiabatic processes 10. Cooling due to adiabatic reversible process 11. Joule Thomson expansion - the Porus Plug experiment 12. Heat engine and efficiency 13. Reversible and Irreversible processes 14. Carnot’s ideal Engine and Carnot’s cycle 15. Reversible and irreversible engine 16. Second law of Thermodynamics 17. Carnot theorem 18. Related Numerical.	15
2	Entropy 1. Concept of Entropy 2. Entropy change in Adiabatic, Reversible and Irreversible processes 3. Principle of increase of Entropy 4. The T- S Diagram 5. The calculation of Entropy 6. Third law of Thermodynamics 7. Unattainability of absolute Zero 8. Application of the Entropy principle 9. Entropy and Disorder, 10. Related Numerical.	15
3	Theory of Radiation 1. Thermal Radiation 2. Black Body and Black Body Radiation 3. Kirchhoff’s Law 4. Stefan Boltzmann Law 5. Distribution of Energy in Black Body Spectrum 6. Wien’s Displacement Law & Wien’s law of energy distribution 7. Voltage gain 8. Rayleigh- Jeans Law 9. Plank’s Law 10. Wien’s law and Rayleigh – Jeans law in relation to Planck’s law 11. Related Numerical	15
4	Thermodynamic Potentials 1. Thermodynamic potentials and their relationships with thermodynamic variables- [Enthalpy, Gibbs, Helmholtz and internal energy functions, Maxwell’s relations] 2. Applications of Maxwell’s relations – Clausius-Clapeyron Equation 3. Specific Heat Equation 4. Joule-Thompson Effect & Joule-Thompson Coefficient 5. TdS Equations 6. Related Numerical.	15

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Suggested Reading:

Text Books:

1. Heat, Thermodynamics, and, Statistical Physics by Singhal, Agrawal & Prakash, Publisher: Pragati Prakashan.
2. Heat, Thermodynamics, and, Statistical Physics by Brijlal, N. Subrahmanyam & P.S. Hemne, Publisher: S.Chand

Reference Books:

1. Thermodynamics, Kinetic Theory & Statistical Thermodynamics by F.W.Sears, and, G.L.Salinger, Publisher: Narosa
2. Modern Physics by R. Murugesan & Kiruthinga Sivaprasath, Publishers: S.Chand
3. Thermal Physics by S.garg, R.Bansal, and, C. Ghosh, Publisher: TMG
4. Heat & Thermodynamics by Mark W. Zemansky, and, R.H. Dittman, Publisher: McGraw Hill, Int. 7th edition.
5. University Physics with Modern Physics By Sears, Zemansky, and, H D Young Publisher: PEARSON

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Course Level	UG		Internal Marks	0
Programme	B.Sc in Physics		External Marks	0
Semester	IV		Practical Internal	50
Category of Course	MAJOR		Practical External	50
Course Credit	4		Prac.External Exam Duration	4 hours
Teaching Hours	120		Total	100
Course Code	MAJPHY413		Exam Duration	4 hours
Course Title	Physics Practical			

Course Objectives:

- The course objective is to provide hands-on experience in verifying key physical laws, determining material properties, and understanding electronic components and circuits. Through practical like Stefan's Law, modulus of rigidity, thermistor energy band gap, transistor characteristics, logic gates, resistance measurement, and the application of electrical theorems, students will develop skills in experimental techniques, data analysis, and practical implementation of theoretical concepts in physics and electronics.

Course Learning Outcomes:

- Upon completion of the course, students should be able to:
- Develop practical skills in setting up and conducting physics and electronics experiments.
- Gain proficiency in using laboratory equipment and measurement techniques.
- Enhance abilities in data collection, analysis, and interpretation.
- Analyze and interpret characteristics and behaviors of various electronic components.
- Improve documentation and reporting skills through structured lab reports.
- Cultivate critical thinking and analytical skills in evaluating experimental results.
- Foster collaboration and teamwork through group experiments and discussions.

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Unit	Syllabi	Teaching Hours
List of Experiments	Practical 1: To verify Stefan's Law. Practical 2: To determine modulus of rigidity by Maxwell's Needle. Practical 3: To calculate thermal energy band gap of Thermistor. Practical 4: To study the drain characteristic of Field Effect Transistor (FET). Practical 5: To study the transfer characteristic of Field Effect Transistor (FET). Practical 6: To study the I-V characteristic of Uni Junction Transistor (UJT). Practical 7: To verify the truth table of OR, AND, NOT, NOR, and, NAND gate. Practical 8: To study the NAND gate as universal gate. Practical 9: To study the NOR gate as universal gate. Practical 10: To determine high resistance by leakage method. Practical 11: To determine specific resistance by Kohlrauch's method. Practical 12: To determine self-induction by Maxwell Bridge. Practical 13: To calculate the unknown capacitance using De Sauty bridge. Practical 14: To study the characteristics of Solar Cell. Practical 15: To determine the e/m by Thomson's method. Practical 16: To verify the Thevinin's theorem. Practical 17: To verify the Maximum Power Transfer theorem. Practical 18: To Study the I-V characteristics of LDR and calculate its resistance. Practical 19: To determine the unknown inductance using Anderson Bridge. Practical 20: To determine the wavelength of the Laser Light.	60

Suggested Reading:

1. B.Sc. Practical Physics by C.L.Arora, Publishers: S.Chand.

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Subject: Physics**SEMESTER-III & IV**

Course Level	UG	Internal Marks	-
Programme	B.Sc in Physics	External Marks	00
Semester	IV	Practical Internal	25
Category of Course	MINOR	Practical External	50
Course Credit	3	Prac.External Exam Duration	4 hours
Teaching Hours	90	Total Marks	75
Course Code	MINPHY411(PRACTICAL)	Exam Duration	4 hours
Course Title	Digital Electronics and Semiconductors/ Fundamental & Electronics Practical		

Unit	Syllabi	Teaching Hours
List of Experiments	Practical 1: To verify Stefan's Law. Practical 2: To determine modulus of rigidity by Maxwell's Needle. Practical 3: To calculate thermal energy band gap of Thermistor. Practical 4: To study the drain characteristic of Field Effect Transistor (FET). Practical 5: To study the transfer characteristic of Field Effect Transistor (FET). Practical 6: To study the I-V characteristic of Uni Junction Transistor (UJT). Practical 7: To verify the truth table of OR, AND, NOT, NOR, and, NAND gate. Practical 8: To study the NAND gate as universal gate. Practical 9: To study the NOR gate as universal gate. Practical 10: To study the characteristics of Solar Cell. Practical 11: To study the I-V characteristics of LDR and calculate its resistance.	90

Suggested Reading:

1. B.Sc. Practical Physics by C.L.Arora, Publishers: S.Chand.

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Course Level	UG	Internal Marks	25
Programme	B.Sc in Physics	External Marks	00
Semester	IV	Practical Internal	00
Category of Course	MINOR	Practical External	00
Course Credit	1	Prac.External Exam Duration	00
Teaching Hours	30	Total	25
Course Code	MINPHY411	Exam Duration	0 hours
Course Title	Digital Electronics and Semiconductors/ Fundamental & Electronics Practical		

Course Objectives:

- The course aims to provide a comprehensive understanding of semiconductor devices, including solar cells, thermistors, and field-effect transistors (FETs), with a focus on their construction, working principles, and applications. It also covers digital circuits, introducing analog and digital signals, number systems, logic gates, Boolean algebra, and the simplification of logic circuits. Students will learn the advantages and disadvantages of digital electronics, enhancing their ability to analyse and design various electronic systems through theoretical knowledge and numerical problem-solving.

Course Learning Outcomes:

- Upon completion of the course, students should be able to:
- Understand the construction, principle, and working of semiconductor devices such as solar cells, thermistors, and field-effect transistors (FETs).
- Grasp the construction, equivalent circuit, and characteristics of Uni Junction Transistors (UJT) and their applications.
- Explain the concepts of analog and digital signals and different number systems.
- Identify and describe the function of basic logic gates (AND, OR, NOT, NAND, NOR) and their universal applications.
- Evaluate the advantages and disadvantages of digital electronics.

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Unit No.	Syllabi	Teaching Hours
1	Semiconductor Devices 1. Solar Cell 2. Thermistor 3. Introduction of Field Effect transistor (FET) 4. Types of FET 5. Construction of Junction Field Effect Transistor (JFET) 6. Principle and Working of JFET 7. Schematic Symbol of JFET 8. Advantages of JFET 9. Construction & Working of Uni Junction Transistor (UJT) 10. Characteristics of UJT . Advantages of UJT 11. Application of UJT	7.5
2	Digital Circuit 1. Introduction 2. Analog and Digital Signal 3. Introduction to Number Systems 4. Decimal to Binary and Binary to Decimal Conversion 5. Binary Coded Decimal Code 6. Logic Gates- AND, OR, NOT, NAND and NOR Gates 7. NAND and NOR Gate as a universal gate 8. Exclusive OR Gate 9. Advantages and Disadvantages of Digital Electronics	7.5

Suggested Reading:

Text Books:

1. Principles of Electronics by V.K.Mehta & Rohit Mehta, Publisher: S.Chand
2. Basic Electronics By B.L.Thereja Publisher: S.Chand

Reference Books:

1. Fundamental of Electronics by D.C.Tayal, Praveen Tayal, Publishers: Himalaya Publishing House
2. Digital principles and applications by Malvino A.P. & Leach .D.P., publisher: Tata McGraw Hill, 7th edition

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INTERNAL EVALUATION SCHEME		
NO	Particulars	Marks
1	Mid Semester Exam(Mandatory)	25
2	Class Test	05
3	Open book exam/test	05
4	Open note exam/test	05
5	Self-test/ Online test	05
6	Essay/Article writing	05
7	Quizzes/Objective test	05
8	Class assignment	05
9	Home assignment	05
10	Reports Writing	05
11	Research/Dissertation	05
12	Case Studies	05
13	Viva/Oral exam	05
14	Group Discussion	05
15	Role Play	05
16	Paper presentation/Seminar	05
17	Language Lab work	05
18	Interview	05
19	Craftwork	05
20	Co-curricular work	05
21	Field Assignment	05
22	Poster Presentation	05
23	Attendance	05
24	Project Work	05
	Total	50

Note: Sr.No.1 is mandatory. Select any five from Sr.No.2 to 24. Each Contains five marks. Students should secure 18 Marks for passing in internal Exam.

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**Paper Style for Sem-3 (MAJPHY 311 & MAJPHY312)
 & Sem-4 (MAJPHY411 & MAJPHY412)**

Ques. No.	Particulars	From which Unit	Marks
1	Answer any 2 out of 3 of the following questions.	1	10
2	Answer any 2 out of 3 of the following questions.	2	10
3	Answer any 2 out of 3 of the following questions.	3	10
4	Answer any 2 out of 3 of the following questions.	4	10
5	Answer any 5 out of 8 of the following questions.	From Each Unit	10
		Total Marks	50

**Paper Style for MAJ313, MDCPHY311 (Practical), MAJ413, MDCPHY411 (Practical)
 (Per Practical of 25 marks) (Duration 2 hours)**

Sr. No.	Particular	Marks
1	Understanding of Practical	15
2	Reading	10
	Total Marks	25
