પરિપત્ર:

ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટીની સાયન્સ વિદ્યાશાખાનાં અભ્યાસક્રમ ચલાવતી તમામ સંલગ્ન કોલેજોનાં આચાર્યશ્રીઓને સવિનય જણાવવાનું કે સાયન્સ વિદ્યાશાખા હેઠળનો NEP-૨૦૨૦ અંતર્ગત ફિઝીક્સ વિષય સેમેસ્ટર-૬નો અભ્યાસક્રમ આ સાથે સામેલ છે.

માનનીય કુલપતિશ્રીની મંજુરી અનુસાર સદર અભ્યાસક્રમ શૈક્ષણિક વર્ષ જુન,૨૦૨૫ થી અમલવારી કરવાની રહે છે. સાયન્સ વિદ્યાશાખાનાં અભ્યાસક્રમ ચલાવતી તમામ સંલગ્ન કોલેજો ધ્વારા તેની અમલવારી કરવા જણાવવામાં આવે છે.

Bhakta Kavi Narsinh Mehta University Junagadh.

ખાસ ફરજ પરના અધિકારી
(એકેડેમિક)

ક્રમાંક/બીકેએનએમયુ/ એકેડેમિક/૭૪૮/૨૦૨૫
ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી,
સરકારી પોલીટેકનિક કેમ્પસ,
ભક્તકવિ નરસિંહ મહેતા યુનિવર્સિટી રોડ,
ખડીયા, જૂનાગઢ-૩૬૨૨૬૩
તા.૦૩/૧૧/૨૦૨૫

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, જુનાગઢ

નકલ રવાના જાણ તથા યોગ્ય કાર્યવાહી અર્થે:

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

BHAKTA KAVI NARSINH MEHTA UNIVERSITY

JUNAGADH

BOARD OF STUDIES

FACULTY OF SCIENCE

SYLLABUS FOR PHYSICS (HONOURS)

PROGRAMME (SEMESTER- VI)

EFFECTIVE FROM JUNE, 2025

BHAKTA KAVI NARSINH MEHTA UNIVERSITY
Syllabus of B.Sc. (Honors) as per NEP-2020
Faculty of Science
Effective from June 2025
Subject: Physics
SEMESTER-VI

SUMMARY OF THE SYLLABUS

Sem No.	Sr. No.	Category of Course	Course Title	Course Level	Credit	Teaching Hrs.	SEE Marks	CCE Marks	Total Marks	Exam Duration
Sem-6	1	Major-14	MAJPHY614	5.5	04	60	50	50	100	02:00 Hours
	2	Major-15	MAJPHY615	5.5	04	60	50	50	100	02:00 Hours
	3	Major-16	MAJPHY616 (P)	5.5	04	120	50	50	100	04:00 Hours
	4	Minor-6	MINPHY606 (P)	5.5	04	120	50	50	100	04:00 Hours
				Total	**20**					

BHAKTA KAVI NARSINH MEHTA UNIVERSITY
Syllabus of B.Sc. (Honors) as per NEP-2020
Faculty of Science
Effective from June 2025
Subject: Physics
SEMESTER-VI

Course Level	5.5		**Internal Marks**	50
Programme	B.Sc. in Physics		**External Marks**	50
Semester	VI		**Practical Internal**	0
Category of Course	Major-14		**Practical External**	0
Course Credit	4		**Prac. External Exam Duration**	0
Teaching Hours	60		**Total**	100
Course Code	MAJPHY614		**Exam Duration**	02:00 Hours
Course Title	**Electrodynamics & Solid-State Electronics**			

Course Objectives:

- **To develop a conceptual understanding** of electrostatic and magnetostatics fields, their laws, and the relationship between electric charges, currents, and fields.
- **To introduce fundamental laws of electromagnetism**, including Faraday's law, Gauss's theorem, and Maxwell's equations, and their physical significance.
- **To familiarize students with electromagnetic wave theory**, including the propagation of waves in free space and boundary conditions.
- **To understand the principles of transistor amplifiers**, their configurations, coupling methods, and performance parameters.
- **To introduce power amplifiers and operational amplifiers**, their characteristics, classifications, and practical applications in analog circuits.
- **To strengthen problem-solving skills** through analytical and numerical exercises related to electric, magnetic, and electronic systems.

Course Learning Outcome: After completing this course, students will be able to:

- **Electrostatics:**
  Apply Gauss's theorem to find electric fields due to point, line, surface, and spherical charge distributions.
- **Electrodynamics:**
  Explain Faraday's and Lenz's laws, derive Maxwell's equations, and apply Poynting's theorem to energy flow in fields.
- **Magnetostatics:**
  Use Biot–Savart's and Ampere's laws to determine magnetic fields and compare properties of electric and magnetic fields.
- **Electromagnetic Waves:**
  Derive and interpret the electromagnetic wave equation, and explain reflection, transmission, and polarization phenomena.
- **Multistage Amplifiers:**
  Describe and analyze multistage transistor amplifiers with RC, transformer, and direct coupling.
- **Power Amplifiers:**
  Classify and compare Class A, B, and push-pull power amplifiers and evaluate their efficiencies.

- **Operational Amplifiers:**
  Explain op-amp configurations and perform basic operations like amplification, addition, subtraction, integration, and comparison.

Course Contents:

Unit No.	Syllabi	Teaching Hours
1	**Electrostatics:** Electrostatic Field, Electric Flux, Gauss's theorem of Electrostatics, Application of Gauss Theorem-Electric field due to point charge, Infinite Line of Charge, Uniformly Charged Spherical Shell and Solid Sphere, Plane Charged Sheet, Charged Conductor. **Electrodynamics:** Ohm's law, Electromotive force and motional emf, Faraday's law, The induced Electric field, inductance, energy in magnetic fields, Electrodynamics before Maxwell, Maxwell's modification of Ampere's law, Maxwell's equations, The continuity equation, Poynting's theorem, Numerical Problems.	**15**
2	**Magnetostatics:** Magnetic fields, Currents, Biot-Savart's law: Steady currents and the magnetic field of steady current, Straight line current, The divergence of B, The Curl of B, Ampere's law with examples, Comparison of Electrostatics and Magnetostatics. **Electromagnetic Waves:** Waves in one dimension: Wave equation, sinusoidal waves, Boundary conditions: Reflection and Transmission, Polarization, Electromagnetic waves in vacuum: The wave equations for E and B, Monochromatic plane waves, Numerical Problems.	**15**
3	**Multi-stage Transistor Amplifiers:** Multistage Transistor Amplifier, Role of Capacitors in Transistor Amplifiers, RC coupled Transistor Amplifier, Transformer Coupled Amplifier, Direct coupled Amplifier, Comparison of Different types of coupling, Numerical Problems. **Transistor Audio Power Amplifiers:** Transistor Audio Power Amplifier, Difference between Voltage and Power amplifier, Performance Quantities of power amplifier, Classification of Power amplifier, Expression for Collector Efficiency, Efficiency of Class A Amplifier, Maximum Efficiency of Transformer Coupled Class A Power amplifier, thermal Runaway, Heat sinks, Mathematical Analysis, Push pull Amplifier, Complementary Symmetry Amplifier, Numerical Problems.	**15**
4	**Operational Amplifier:** Introduction, Differential Amplifier, Basic circuit of Differential Amplifier, Operation of Differential Amplifier, Common-mode and Differential-mode signals, OP-AMP Applications, Inverting Amplifier, Non-Inverting Amplifier, Voltage Follower, Summary of Op-Amp Configuration, Adder, Subtractor, Integrator, Differentiator, Comparator, Comparator Circuit.	**15**

Suggested Reading:

Text Books:

1. Introduction to electrodynamics by David J Griffiths, Publisher: PHI.
2. Principles of Electronics by V.K. Mehta & Rohit Mehta. Publisher: S. Chand &Company Ltd.
3. Basic Electronics by B.L. Theraja, Publisher: S. Chand & Company Ltd.
4. Op-Amp & Linear Integrated Circuit by Ramakant A. Gayakwad, Publisher: PHI Learning Pvt. Ltd., New Delhi

Reference Books:

1. Electricity and Magnetism - Mahajan and Rangwala
2. Classical Electrodynamics - J.D. Jackson
3. Electricity and Magnetism - R. Murugeshan
4. Electromagnetics - B.B. Laud
5. Electricity and Magnetism - K.K. Tiwari
6. Electricity and Magnetism - Berkeley Physics Course, Vol. II
7. Electricity and Magnetism by D.C. Tayal, Publisher: Himaliya publishing House.

Course Level	5.5		**Internal Marks**	50
Programme	B.Sc. in Physics		**External Marks**	50
Semester	VI		**Practical Internal**	0
Category of Course	Major-15		**Practical External**	0
Course Credit	4		**Prac. External Exam Duration**	0
Teaching Hours	60		**Total**	100
Course Code	MAJPHY615		**Exam Duration**	02:00 Hours
Course Title	**Indian Knowledge System (IKS)**			

Course Objectives:

- To study the **astronomical contributions of Indian scientists** such as Āryabhaṭa, Varāhamihira, and Bhāskara, and understand their methods for observing and calculating celestial phenomena.
- To understand the development of **atomic and molecular spectroscopy**, emphasizing the experimental and theoretical contributions of **C.V. Raman**.
- To introduce **quantum statistics** and highlight the pioneering work of **Satyendra Nath Bose** in Bose-Einstein statistics.
- To appreciate the **integration of Indian scientific thought with modern physics**, including classical observations, mathematical methods, and experimental innovations.
- To develop skills in analyzing **spectroscopic data, astronomical models, and statistical mechanics problems**, reflecting Indian scientific heritage.

Course Learning Outcomes: After completing this course, students will be able to:

Indian Astronomy

- Explain the contributions of **Āryabhaṭa, Varāhamihira, Brahmagupta, and Bhāskara** in celestial mechanics, planetary motion, and timekeeping.
- Describe traditional **Indian observational tools** (e.g., Sanku, Yantras) and methods of mapping the night sky.
- Identify **Nakshatras, Rashis, and retrograde motion of planets** using both ancient methods and modern software simulations.

Atomic and Molecular Spectroscopy

- Understand the **production and types of spectra** (emission and absorption).

- Explain **Bohr's atomic model, Sommerfeld orbits, spin, and quantum numbers**, highlighting the influence of Indian mathematical methods in developing quantum ideas.
- Describe **Zeeman and Stark effects** from experimental and theoretical perspectives.

C.V. Raman and Raman Spectroscopy

- Explain the **Raman effect** and its experimental discovery by **C.V. Raman**.
- Understand classical and quantum theories of Raman scattering.
- Apply Raman spectroscopy in **molecular structure determination** and recognize its significance in modern physics.

Satyendra Nath Bose and Quantum Statistics

- Explain **phase space, microstates, macrostates, and thermodynamic probability** in statistical mechanics.
- Derive the **Bose-Einstein distribution law** and discuss its physical implications.
- Compare **Maxwell-Boltzmann, Bose-Einstein, and Fermi-Dirac statistics**, highlighting Bose's pioneering contribution.
- Solve numerical problems related to Bose-Einstein statistics and understand its relevance in **modern condensed matter physics**.

Course Contents:

Unit No.	Syllabi	Teaching Hours
1	**Indian Astronomy:** Ancient Indian astronomy, Aryabhatta-1, Scales and dimensions, Night sky, Constellations, Earth, Sun and the solar system, Retrograde motion of planets, Sidereal time, Astronomical catalogs and software.	**15**
2	**Atomic Spectroscopy:** Production of Spectra, Type of Spectra- Emission Spectra, Absorption Spectra, The spinning electron, Space quantization, Quantum numbers and their physical interpretations, Magnetic moments of an Atom and Lande's g Factor, Experimental study of Zeeman effect, Classical interpretation of Normal Zeeman effect, Vector atom model and Normal Zeeman effect, Vector atom model and Anomalous Zeeman effect, Paschenback effect, Stark effect.	**15**
3	**Molecular & Raman Spectroscopy:** Introduction, Experimental study, Theoretical explanation, Theory of pure rotational Spectra, Theory of rotational Vibrational Spectra, Theory of electronic band Spectra, Raman effect and its Salient features, Observation of Raman Spectra, Classical theory of Raman effect, Quantum theory of Raman effect, Vibrational Raman Spectra, Pure Rotational Raman Spectra, Vibrational- Rotational	**15**

	Raman Spectra, Structure determination from Raman Spectroscopy, Applications and its importance.	
4	**Indian contribution to Statistical Mechanics:** Phase Space (till the derivation of ($d^3r = h^3$), Volume in Phase Space, Micro States and Macro States (number of microstates accessible to a macroscopic system onwards not included), Stirling's approximation, Thermodynamic Probability, Division of Phase Space into Cells, Classical Maxwell Boltzmann Distribution law. Bose-Einstein and Fermi-Dirac Statistics Derivation of the distribution law of Bose-Einstein Statistics, Derivation of the distribution law of Fermi Dirac Statistics, Comparison of the Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac Statistics, Numerical Problems.	**15**

Suggested Reading:

Text Books:

1. An introduction to astronomy and astrophysics by Pankaj Jain
2. Elements of Spectroscopy by Gupta, Kumar, Sharma Publisher: Pragati Prakashan Twenty-eight Edition 2016.
3. Atomic Physics By J.B.Rajam, Publisher: S.Chand & Company Ltd.
4. Fundamental of molecular spectroscopy by colin, Banwell & Elaine M MaCash, Publisher: TMG
5. Elementary Statistical Mechanics by Gupta and Kumar, Publisher: Pragati Prakashan.

Reference Books:

1. Indian Astronomy; An introduction by S. Balachandra Rao (Universities Press)
2. A Text Book of Optics N.Subrahmanyan, Brij Lal & M.N.Avadhanulu, Publisher: S.Chand & Company Ltd.
3. Optics and Spectroscopy - R. Murugeshan & Kiruthiga Sivaprashatha, Publisher: S.Chand & Company Ltd.

Course Level	5.5		**Internal Marks**	0
Programme	B.Sc. in Physics		**External Marks**	0
Semester	VI		**Practical Internal**	50
Category of Course	Major-16		**Practical External**	50
Course Credit	4		**Prac. External Exam Duration**	2 + 2 = 04:00 Hours
Teaching Hours	120		**Total**	100
Course Code	MAJPHY616		**Exam Duration**	
Course Title	**Physics Practical**			

Course Objectives:

- The objective of this course is to train the students in the accurate handling of scientific instruments and the correct methods of data collection. Students will understand the concept of fundamental physics through hands-on practice.
- With the help of this course analytical skill of students will improve by analyzing experimental data, recognize patterns and plot logical conclusion.

Course Learning Outcomes: Upon completion of the course, students should be able to:

- Apply theoretical knowledge to design and perform physics experiments accurately.
- Demonstrate proficiency in using laboratory instruments and experimental techniques.
- Analyse and interpret experimental data to validate physical laws and principles.
- Develop skills in scientific communication by preparing clear, precise lab reports.
- Identify experimental errors and suggest methods to minimize them for better accuracy.
- Work collaboratively and ethically in a lab environment, promoting teamwork and responsibility.

Course Contents:

Unit	Syllabi	Teaching Hours
List of Experiments	**Group A** 1. To Study of Resonance Pendulum. 2. To Determine the Young's Modulus by Koeing Method.	**60**

	3. Determine the Elastic constants using Flat Spiral Spring. 4. Resolving power of Diffraction Grating. 5. To measure the divergence of a given LASER source. 6. Photo Conductivity of Selenium cell 7. Characteristics of SCR. 8. Study of Linear Variable Differential Transformer (LVDT) Trainer. 9. To determine e/m by Thomson's method. 10. To verify the Thevenin's theorem. 11. To determine self-inductance of a coil by Anderson's Bridge. **Group B** 1. Study of the Output Wave form Clipping circuit 2. Study of the Output Wave form Clamping circuit 3. Study of OP-AMP using IC 741. (adder and Subtractor)/ (inverter and noninverter). 4. To study the working of an OP-AMP as integrator and differentiator. 5. Study of IC 555 Timer circuit. 6. Study of Multiplexer (4-1 line) using (Discrete components or using IC. 7. Study of Demultiplexer (1-4 line) using (Discrete components or using IC 8. Study of Encoder & Decoder Circuit. 9. Study of Astable / Monostable Multivibrator. 10. Study of UJT as Relaxation Oscillator. 11. Study of RS, D & JK Flip-flop.	

Suggested Reading:

1. Practical Physics by C.L. Arora (S. Chand)
2. Advanced Practical Physics by Chauhan & Singh. (Pragati Prakashan)
3. B. Saraf et al-Physics through experiments Vol. I & II
4. Electronic Laboratory Primer by Poorna Chandra & Sasikala, (S. Chand)
5. Practical Physics by Chattopadhyay, Rakshit & Saha.

Course Level	5.5		**Internal Marks**	0
Programme	B.Sc in Physics		**External Marks**	0
Semester	VI		**Practical Internal**	50
Category of Course	Minor-06		**Practical External**	50
Course Credit	4		**Prac. External Exam Duration**	2 + 2 = 04:00 Hours
Teaching Hours	120		**Total**	100
Course Code	MINPHY606		**Exam Duration**	
Course Title	**Physics Practical**			

Course Objectives:

- The objective of this course is to train the students in the accurate handling of scientific instruments and the correct methods of data collection. Students will understand the concept of fundamental physics through hands-on practice.
- With the help of this course analytical skill of students will improve by analyzing experimental data, recognize patterns and plot logical conclusion.

Course Learning Outcomes: Upon completion of the course, students should be able to:

- Apply theoretical knowledge to design and perform physics experiments accurately.
- Demonstrate proficiency in using laboratory instruments and experimental techniques.
- Analyse and interpret experimental data to validate physical laws and principles.
- Develop skills in scientific communication by preparing clear, precise lab reports.
- Identify experimental errors and suggest methods to minimize them for better accuracy.
- Work collaboratively and ethically in a lab environment, promoting teamwork and responsibility.

Course Contents:

Unit	Syllabi	Teaching Hours
List of Experiments	**Group A** 1. To Study of Resonance Pendulum. 2. To Determine the Young's Modulus by Koeing Method. 3. To measure the divergence of a given LASER source. 4. Photo Conductivity of Selenium cell 5. Characteristics of SCR. 6. Study of Linear Variable Differential Transformer (LVDT) Trainer. 7. To verify the Thevenin's theorem. 8. To determine self-inductance of a coil by Anderson's Bridge. **Group B** 1. Study of the Output Wave form Clipping circuit 2. Study of the Output Wave form Clamping circuit 3. Study of IC 555 Timer circuit. 4. Study of Multiplexer (4-1 line) using (Discrete components or using IC. 5. Study of Demultiplexer (1-4 line) using (Discrete components or using IC 6. Study of Encoder & Decoder Circuit. 7. Study of Astable / Monostable Multivibrator. 8. Study of RS, D & JK Flip-flop.	**60**

Suggested Reading:

1. Practical Physics by C.L. Arora (S. Chand)
2. Advanced Practical Physics by Chauhan & Singh. (Pragati Prakashan)
3. B. Saraf et al-Physics through experiments Vol. I & II
4. Electronic Laboratory Primer by Poorna Chandra & Sasikala, (S. Chand)
5. Practical Physics by Chattopadhyay, Rakshit & Saha.

INTERNAL EVALUATION SCHEME		
NO	**Particulars**	**Marks**
1	**Mid Semester Exam/ Practical 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.

Paper Style

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