KURUKSHETRA UNIVERSITY
KURUKSHETRA

(Established by the State Legislature Act XII of 1956)
("A++" Grade NAAC Accredited)

Revised Scheme of Examination for Undergraduate Programme

Subject: PHYSICS

Under Multiple Entry-Exit, Internships and

CBCS-LOCF in accordance to NEP 2020

w.e.f. 2025-26 (in phased manner)

Kurukshetra University Kurukshetra

Revised Scheme and Syllabus of Examination for Undergraduate programme
Subject: PHYSICS
Under Multiple Entry-Exit, Internships and
CBCS-LOCF in accordance to NEP 2020
w.e.f. 2025-26 (in phased manner)

Semester	Course Type	Course Code	Nomenclature of paper	Credits	Contact hours	Internal marks	End term Marks	Total Marks	Duration of exam (Hrs) T / P
1	CC-1/ MCC-1	B23-PHY-101	Mechanics	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
	MCC-2	B23-PHY-102	Mathematical Physics	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
	CC-M1	B23-PHY-103	Elementary Mechanics	1	1	10	20	30	3
			Practicum	1	2	5	15	20	3
	MDC-1	B25-PHY-104	Physics Fundamentals-I	2	2	15	35	50	3
			Practicum	1	2	5	20	25	3
2	CC-2 MCC-3	B23-PHY-201	Electricity and Magnetism & EM Theory	3	3	20	50	70	3
			Practicum	1	3	10	20	30	3
	CC-M2	B23-PHY-202	Elementary Electricity, Magnetism & EM Theory	1	1	10	20	30	3
			Practicum	1	2	5	15	20	3
	DSEC-1	B23-PHY-203	Computational Physics	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
	MDC-2	B25-PHY-204	Physics Fundamentals-II	2	2	15	35	50	3
			Practicum	1	2	5	20	25	3

3	CC-3/ MCC-4	B23-PHY-301	Thermodynamics & Statistical Physics	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
	MCC-2	B23-PHY-102	Mathematical Physics	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
	MCC-5	B23-PHY-303	Classical Mechanics	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
	MDC-3	B23-PHY-304	Elements of Modern Physics	2	2	15	35	50	3
			Practicum	1	2	5	20	25	3
	CC-M3	**B25-PHY-305**	**Thermal Physics**	**3**	**3**	**20**	**50**	**70**	**3**
			Practicum	**1**	**2**	**10**	**20**	**30**	**3**
4	CC-4/ MCC-6	B23-PHY-401	Waves and Optics	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
	MCC-7	B23-PHY-402	Introductory Quantum Mechanics	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
	MCC-8	B23-PHY-403	Atomic Spectroscopy	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
	DSE-1	B23-PHY-404	Laser Physics and Fiber Optics	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
		OR							
		B23-PHY-405	Physics of Nano Materials	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
5	CC-5 MCC-9	B23-PHY-501	Modern Physics	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3

	MCC-10	B23-PHY-502	Nuclear Physics	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
	DSE-2	B23-PHY-503	Environmental Physics	4	4	30	70	100	3
		OR							
		B23-PHY-504	Nonlinear Dynamics	4	4	30	70	100	3
	DSE-3	B23-PHY-505	Instrumentation and Analytical Methods	4	4	30	70	100	3
		OR							
		B23-PHY-506	Renewable Energy and Energy Harvesting	4	4	30	70	100	3
6	CC-6 MCC-11	B23-PHY-601	Electronics	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
	MCC-12	B23-PHY-602	SolidStatePhysics-1	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
	DSE-4	B23-PHY-603	Radiation Physics	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
		OR							
		B23-PHY-604	Thin Films and Characterization	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
	DSE-5	B23-PHY-605	Numerical Methods in Physics	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
		OR							
		B23-PHY-606	Applied Nuclear Techniques	3	3	20	50	70	3
			Practicum	1	2	10	20	30	3
	CC-M6	**B25-PHY-607**	**Basic Electronics**	**3**	**3**	**20**	**50**	**70**	**3**
			Practicum	**1**	**2**	**10**	**20**	**30**	**3**

7	CC-H1	B23-PHY-701	Advanced Mathematical Physics	4	4	30	70	100	3
	CC-H2	B23-PHY-702	Advanced Classical Mechanics	4	4	30	70	100	3
	CC-H3	B23-PHY-703	Quantum Mechanics-I	4	4	30	70	100	3
	DSE-6 /DSE-H1	B23-PHY-704	Electronics Devices and Circuits-I	4	4	30	70	100	3
		OR							
		B23-PHY-705	Sensors and Transducers	4	4	30	70	100	3
	PC-H1	B23-PHY-706	Practicum Course	4	8	30	70	100	4
	CC-HM1	B23-PHY-707	Basics of Laser Physics and Fiber Optics	4	4	30	70	100	3
8	CC-H4	B23-PHY-801	Quantum Mechanics-II	4	4	30	70	100	3
	CC-H5	B23-PHY-802	Nuclear and Particle Physics	4	4	30	70	100	3
	CC-H6	B23-PHY-803	Solid State Physics-II	4	4	30	70	100	3
	DSE-7 /DSE-H2	B23-PHY-804	Electronic Devices and Circuits-II	4	4	30	70	100	3
		OR							
		B23-PHY-805	Astrophysics	4	4	30	70	100	3
	PC-H2	B23-PHY-806	Practicum Course	4	8	30	70	100	4
	Research	B23-PHY-R-807	Project/ Dissertation	12			300	300	
	CC-HM2	B23-PHY-808	Nanoscience and Nanomaterials	4	4	30	70	100	3

Scheme of Examination for VAC/VOC

Semester	Course Type	Course Code	Nomenclature of paper	Credits	Contact hours	Internal marks	End term Marks	Total Marks	Duration of exam (Hrs) T / P
3	VAC	B23-VAC-316	Indian Astronomy in the 18^{th} and 19^{th} Centuries	2	2	15	35	50	3
3	VAC	B23-VAC-318	Basics of Indian Astronomy	2	2	15	35	50	3
3	VAC	B23-VAC-326	Exploring the Journey of Indian Space Satellites	2	2	15	35	50	3
4	VAC	B23-VAC-419	Physics in Everyday Life	2	2	15	35	50	3
4	VAC	B23-VAC-423	Radiations and its Hazards in Daily Life	2	2	15	35	50	3
4	VOC	B23-VOC-207	Maintenance of Electrical Appliances	2	2	15	35	50	3
			Practicum	2	4	15	35	50	3
5	VOC	B23-VOC-114	Refrigeration and Air Conditioning	2	2	15	35	50	3
			Practicum	2	4	15	35	50	3
6	VOC	B23-VOC-322	Maintenance of Laboratory Instruments	2	2	15	35	50	3
			Practicum	2	4	15	35	50	3
6	VOC	B23-VOC-323	Installation and Maintenance of Solar Panels	2	2	15	35	50	3
			Practicum	2	4	15	35	50	3

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Revised Syllabi of MDC for Undergraduate Programme

Subject: PHYSICS

Under Multiple Entry-Exit, Internships and

CBCS-LOCF in accordance to NEP-2020

w.e.f. 2025-26

Kurukshetra University Kurukshetra
Undergraduate Programs
Course: MDC-1

Session: 2025-26			
Part A - Introduction			
Subject	Physics		
Semester	1st		
Name of the Course	Physics Fundamentals –I		
Course Code	B25-PHY-104		
Course Type: (CC/MCC/MDC/CC-M/ DSEC /VOC/DSE/PC/AEC/VAC)	MDC		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	Not studied Physics subject at level 4 (i.e. 10+2 or equivalent)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Have knowledge about the nature, scope and impact of physics on technological development of the society. 2. Understand and describe motion of an object in one dimension. 3. Understand and describe the laws of motion and their applications in daily life. 4. Understand and appreciate the importance of work, power and energy in daily life. 5. Learn to present observations, results, analysis and different concepts related to experiments of Physics Fundamentals –I		
Credits	Theory	Practical	Total
	2	1	3
Contact Hours	2	2	4
Max. Marks:75 **Internal Assessment Marks:20** **End Term Exam Marks:55**		**Time:3hrs**	

Part B-Contents of the Course		
Instructions for Paper- Setter **1.**Nine questions will be set in total. **2.** Question no. 1 will be compulsory and based on the conceptual aspects of the entire syllabus. This question may have 4 parts and the answer should be in brief but not in Yes/No. **3.** Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. All questions will carry equal marks. **4.**Question paper will be set in both Hindi and English languages.		
Unit	Topics	**Contact Hours**
I	Physics-Nature, scope and excitement, major discoveries in Physics, major contribution by Indian Physicists, Physics in relation to other sciences, impact of physics on society and on latest development in science and technology. Units and Dimensions – Physical quantities – fundamental (mass, length and time) and derived. Need of measurement, fundamental and derived units, measuring process.	8
II	Scalar and Vector quantities with definition, representation and examples, unit vectors, position vector, co-initial vector, collinear vector and co-planar vector. Scalar and vector product (no derivation). Motion of objects in one, two and three dimensions with examples, concept of position, distance, displacement, speed, velocity andaverage velocity.	7
III	Causes of motion- concept of force, Newton's laws of motion, daily life applications of Newton's laws of motion, inertia, linear momentum and their significance.Force of friction with daily life examples, Impulse with examples.Circular and rotational motion with examples.	7
IV	Work, Power and Energy – Work - definition, symbol, formula, units and type of work (zero, positive, negative) with examples. Energy - definition, symbol, formula, units, examples, types of mechanical energy, kinetic energy - definition, symbol and formula, potential energy - definition, symbol and formula, daily life examples demonstrating importance of energy, potential energy of an object at a height. Power – definition, formula and units, daily life examples.	8
	Practicum 1. To measure the diameter of a small spherical / cylindrical body. 2. To measure the length, width and height of the given rectangular block. 3. To measure the internal diameter and depth of a given beaker/calorimeter and hence find its volume. 4. Use of screw gauge:(i) to measure diameter of a given wire and (ii) to measure thickness of a given sheet 5. To determine radius of curvature of a given spherical surface by a spherometer.	30

	6. To find the weight of a given body using parallelogram law of vectors. 7. Verification of Archimedes principle. 8. Verification of Work-energy theorem. 9. Acceleration due to gravity (g) by bar pendulum. 10. Study of law of conservation of linear momentum and Kinetic Energy. **Note: Student will perform at least six experiments. The examiner will allot one practical at the time of end term examination.**	

Suggested Evaluation Methods

Internal Assessment: ➢ **Theory (15 Marks)** • Class Participation: **04 Marks** • Seminar/presentation/assignment/quiz/class test etc.: **04 Marks** • Mid-Term Exam: **7 Marks** ➢ **Practicum (5 Marks)** • Class Participation: **Nil** • Seminar/Demonstration/Viva-voce/Lab records etc.: **5 Marks** • Mid-Term Exam: **Nil**	**End Term Examination : 35 Marks** **: 20 Marks**

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Essential University Physics, Vol.-1 &2 by Richard Wolfson, Pearson Education, Patparganj, Delhi, India.
2. Concept of Physics by H.C. Verma, Bharti Bhawan, Ansari Road, Daryaganj, New Delhi, India.
3. Modern Physics (2^{nd} edition), by S.L. Kakani and Shubhra Kakani, Viva Books, New Delhi.
4. Physics for Scientists and Engineers with Modern Physics, 7^{th} edition, by Raymond A. Serway and John W. Jewett, Jr., Thomson Higher Education 10 Davis Drive Belmont, CA 94002-3098 USA.
5. Physics For You, Fifth Edition, by Keith Johnson, OUP Oxford; 5th edition (23 June 2016).
6. B.Sc Practical Physics, C. L. Arora, R Chand & Co. New Delhi
7. B.Sc Practical Physics, Harnam Singh and Dr. P.S. Hemne, S Chand & Company Ltd.

Kurukshetra University Kurukshetra
Undergraduate Programs
Course: MDC-2

Session: 2025-26			
Part A - Introduction			
Subject	Physics		
Semester	2nd		
Name of the Course	**Physics Fundamentals-II**		
Course Code	B25-PHY-204		
Course Type: (CC/MCC/MDC/CC-M/ DSEC /VOC/DSE/PC/AEC/VAC)	MDC		
Level of the course (As per Annexure-I	100-199		
Pre-requisite for the course (if any)	Not studied Physics subject at level 4 (i.e. 10+2 or equivalent)		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Have basic knowledge about Wavemotion, SHM, the associated phenomena and their applications in daily life 2. Have basic knowledge about nature of light, the associated phenomena and their importance in daily life 3. Have basic knowledge about electric current, electric circuit, electric components, and practical utility of heating and magnetic effects of electric current 4. Grasp an introductory idea about the Electric components and circuits 5. Understand the observations, results, analysis and different concepts related to experiments of light & optics.		
Credits	Theory	Practical	Total
	2	1	3
Contact Hours	2	2	4
Max. Marks:75 **Internal Assessment Marks:20** **End Term Exam Marks:55**		**Time:3hrs**	

Part B-Contents of the Course

Instructions for Paper- Setter

1. Nine questions will be set in total.

2. Question no. 1 will be compulsory and based on the conceptual aspects of the entire syllabus. This question may have 4 parts and the answer should be in brief but not in Yes/No.

3. Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. All questions will carry equal marks.

4. Question paper will be set in both Hindi and English languages.

Unit	Topics	Contact Hours
I	Wave motion and applications – Waves -definition, types (mechanical and electromagnetic wave), Wave motion -transverse and longitudinal with examples, terms used in wave motion like displacement, amplitude, time period, frequency, wavelength, wave velocity; relationship among wave velocity, frequency and wavelength. Simple harmonic motion (SHM): definition and examples.	8
II	Light and ray optics – Definition, nature, speed and properties of light, reflection and refraction of light, laws of reflection and refraction, examples and applications in daily life, reflection through mirrors (plane, convex and concave) and refraction through lenses (concave and convex), refractive index, refraction of light through prism (dispersion of light), rainbow formation, twinkling of stars, advance sunrise and delayed sunset.	7
III	Electricity- electric charge, types of charges, unit of charge, frictional electricity, Coulomb's law of electrostatics, electric field, electric lines of force, electric field intensity (definition and properties), electric flux, electric current, units of electric current, direct and alternating current, measurement of current, resistance, resistivity and Ohm's law, electric potential, potential difference and emf.	8
IV	Electric components and circuits - resistor, capacitor, electric cell, ammeter, voltmeter, galvanometer, keys and variable resistors. Series and parallel combinations of resistors, domestic electrical wiring and electrical safety (fuse, hot wire, neutral, ground and short circuit), electric power and electric power transmission; Heating effect of current and its practical applications.	7
	Practicum 1. To find the focal length of a convex mirror using a convex lens. 2. To find the value of v for different values of u in the case of a concave mirror and to find the focal length 3. To find the focal length of a concave lens using a convex lens. 4. To determine the refractive index of a glass slab 5. To find the refractive index of a liquid using a convex lens and plane mirror 6. To determine the resistivity of different wires by plotting a graph for potential difference versus current.	30

	7. To verify Ohm's law for metallic conductor and to determine its resistance. 8. To find the frequency of AC mains with a sonometer. 9. Use of Multimeter for measuring Resistance, A.C. and D.C. Voltage and Current, checking of electrical fuses. 10. Use of Multimeter to check the working condition of diode, an LED, a resistor and a capacitor. **Note: Student will perform at least six experiments. The examiner will allot one practical at the time of end term examination.**	

Suggested Evaluation Methods

Internal Assessment: ➢ **Theory (15 Marks)** • Class Participation: **04 Marks** • Seminar/presentation/assignment/quiz/class test etc.: **04 Marks** • Mid-Term Exam: **7 Marks** ➢ **Practicum (05 Marks)** • Class Participation: **Nil** • Seminar/Demonstration/Viva-voce/Lab records etc.: **05 Marks** • Mid-Term Exam: **Nil**	**End Term Examination : 35 Marks** **20 Marks**

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Essential University Physics, Vol.-1 &2 by Richard Wolfson, Pearson Education, Patparganj, Delhi, India.
2. Concept of Physics by H.C. Verma, Bharti Bhawan, Ansari Road, Daryaganj, New Delhi, India.
3. Modern Physics (2^{nd} edition), by S.L. Kakani and Shubhra Kakani, Viva Books, New Delhi.
4. Physics for Scientists and Engineers with Modern Physics, 7^{th} edition, by Raymond A. Serway and John W. Jewett, Jr., Thomson Higher Education 10 Davis Drive Belmont, CA 94002-3098 USA.
5. Physics For You (Fifth Edition) by Keith Johnson.
6. B.Sc Practical Physics, C. L. Arora, R Chand & Co. New Delhi
7. B.Sc Practical Physics, Harnam Singh and Dr. P.S. Hemne, S Chand & Company Ltd.

Kurukshetra University Kurukshetra
Undergraduate Programs
Course: MDC-3

<table>
<tr><td colspan="4">Session: 2025-26</td></tr>
<tr><td colspan="4">Part A - Introduction</td></tr>
<tr><td>Subject</td><td colspan="3">Physics</td></tr>
<tr><td>Semester</td><td colspan="3">3rd</td></tr>
<tr><td>Name of the Course</td><td colspan="3">Elements of modern Physics</td></tr>
<tr><td>Course Code</td><td colspan="3">B25-PHY-304</td></tr>
<tr><td>Course Type: (CC/MCC/MDC/CC-M/ DSEC /VOC/DSE/PC/AEC/VAC)</td><td colspan="3">MDC</td></tr>
<tr><td>Level of the course (As per Annexure-I</td><td colspan="3">100-199</td></tr>
<tr><td>Pre-requisite for the course (if any)</td><td colspan="3">Not studied Physics subject at level 4 (i.e. 10+2 or equivalent)</td></tr>
<tr><td>Course Learning Outcomes (CLO):</td><td colspan="3">After completing this course, the learner will be able to:
1. Have introductory idea about the importance of semiconductors and basic semiconductor devices
2. Have the knowledge about the importance of magnetic materials
3. Understand importance of radioisotopes, Nuclear fission and fusion reactions and their hazardous aspects also
4. Have the knowledge about the lasers and optical fibers and their importance in scientific and technological fields
5. Learn to present observations, results, analysis and different concepts related to experiments of Elements of modern Physics.</td></tr>
<tr><td rowspan="2">Credits</td><td>Theory</td><td>Practical</td><td>Total</td></tr>
<tr><td>2</td><td>1</td><td>3</td></tr>
<tr><td>Contact Hours</td><td>2</td><td>2</td><td>4</td></tr>
<tr><td colspan="2">Max. Marks:75
Internal Assessment Marks:20
End Term Exam Marks:55</td><td colspan="2">Time:3hrs</td></tr>
</table>

Part B-Contents of the Course

Instructions for Paper- Setter

1.Nine questions will be set in total.

2. Question no. 1 will be compulsory and based on the conceptual aspects of the entire syllabus. This question may have 4 parts and the answer should be in brief but not in Yes/No.

3. Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. All questions will carry equal marks.

4.Question paper will be set in both Hindi and English languages.

Unit	Topics	Contact Hours
I	Basics of semiconductors -energy levels and energy bands (basic idea), types of materials (conductors, semiconductors and insulators) their energy band diagrams and definition on the basis of energy gap, intrinsic semiconductors, extrinsic semiconductors-p-type and n-type semiconductors (basic idea), Basics of Semiconductor devices - P-N Junction Diode – simple idea of depletion layer, forward and reverse bias, V-I characteristics (qualitative idea only), Applications of Diode, Photodiode, Solar Cell, and LED	8
II	Magnetic Materials- Paramagnetic, Diamagnetic, Ferromagnetic – basic properties and uses, Piezoelectric Materials – simple explanation and applications (e.g., sensors, lighters), Introduction to Ceramics and Polymers – with everyday examples and uses, Superconductors - Applications, Introduction to Nanomaterials – general idea and simple applications (e.g., sunscreens, fabrics).	8
III	Structure of the atomic nucleus: charge, mass (qualitative), atomic number, mass number, Isotopes, Isobars, Isotones, Radioactive Decay (Basic idea) – α, β, γ rays their properties and applications, Use of Radioisotopes in medicine and agriculture, Nuclear Energy – Nuclear fission and fusion, Nuclear Reactors and source of energy of stars.	7
IV	Introduction to Laser - absorption, spontaneous emission and stimulated emission (basic idea) Characteristics and applications of laser in daily life Basics of Optical Fibers: Introduction, principle and simple working, Applications in different fields.	7
	Practicum 1. V-I characteristics of p-n junction diode. 2. To study the working of an LED and observe how it emits light 3. To verify the use of a diode as a switch in simple circuits 4. To study magnetic properties of materials (using iron, aluminum, and copper samples) 5. To observe and compare different materials – conductors, semiconductors, and insulators using a multimeter 6. To find the Total Internal Reflection using a laser pointer and water	30

	7. To observe and study the parts of an optical fiber cable 8. Characteristics of Solar Cell 9. To verify the inverse square law of light using a photo-voltaic cell. 10. To determine value of Boltzmann constant using V-I characteristic of PN diode. **Note: Student will perform at least six experiments. The examiner will allot one practical at the time of end term examination.**	

Suggested Evaluation Methods

Internal Assessment: ➢ **Theory (15 Marks)** • Class Participation: **04 Marks** • Seminar/presentation/assignment/quiz/class test etc.: **04 Marks** • Mid-Term Exam: **7 Marks** ➢ **Practicum (5 Marks)** • Class Participation: **Nil** • Seminar/Demonstration/Viva-voce/Lab records etc.: **5 Marks** • Mid-Term Exam: **Nil**	**End Term Examination : 35 Marks** **: 20 Marks**

Part C- Learning Resources

Recommended Books/e-resources/LMS:

1. Concept of Modern Physics by Arthur Beiser, McGraw Hill Education.
2. Modern Physics (2nd edition), by S.L. Kakani and Shubhra Kakani, Viva Books, New Delhi.
3. Semiconductor Devices - Physics and Technology by S.M .Sze ,Wiley (1985)
4. Laser and Non-linear optics by B.B.Laud. ,Wiley Eastern Limited (1985)
5. Semiconductor Electronics by A.K.Sharma ,New Age International Publisher(1996)
6. Kenneth S. Krane, Introductory Nuclear Physics, Wiley, New York, 1988
7. Radiation detection and measurement: G.F. Knoll (Wiley, New York) (2000)
8. Verma and Srivastava : Crystallography for Solid State Physics
9. Rajnikant; Solid State Physics, Willey India, 2011.
10. J.C. Anderson, KD. Leaver, R.D. Rawlings and J.M. Alexander, Materials Science, 4th Edition (ChapmanHall, London, 1990).
11. V. Raghavan, Materials Science and Engineering, 3rd Ed. (Prentice-Hall India, New Delhi, 1993).
12. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House
13. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn 4 Edition, reprinted 1985, Heinemann Educational Publishers
14. B.Sc Practical Physics, C. L. Arora, R Chand & Co. New Delhi
15. B.Sc Practical Physics, Harnam Singh and Dr. P.S. Hemne, S Chand & Company Ltd.

KURUKSHETRA UNIVERSITYKURUKSHETRA

(Established by the State Legislature Act XII of 1956)

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Syllabi of Minor courses (3rd& 6th semesters) for Undergraduate Programme

Subject: PHYSICS

Under Multiple Entry-Exit, Internships and

CBCS-LOCF in accordance to NEP 2020

w.e.f. 2025-26

Kurukshetra University Kurukshetra

Undergraduate Programs

Course: CC-M3

Session: 2025-26			
Part A - Introduction			
Subject	Physics		
Semester	3rd		
Name of the Course	Thermal Physics		
Course Code	B25-PHY-305		
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-M		
Level of the course (As per Annexure-I)	200-299		
Pre-requisite for the course (if any)	Appeared or passed the 2nd sem with physics as minor subject		
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Understand the thermodynamics laws and their applications, Carnot theorem, Carnot cycle and thermodynamic variables. 2. Learn the concept of entropy for perfect gas, third law of thermodynamics, T-S diagram and phase change. 3. Learn the thermodynamic potentials and Maxwell thermodynamic relations. 4. Understand the behavior of the real gas, Virial equation, critical constants, Van-der Waal's equation, P-V diagram and Joule's experiment. 5. Learn to present observations, results, analysis and different concepts related to experiments of thermal physics.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100 **Internal Assessment Marks:30** **End Term Exam Marks:70**		**Time:3hrs**	

Part B-Contents of the Course

Instructions for Paper- Setter

1. Nine questions will be set in total.
2. Question no. 1 will be compulsory and based on the conceptual aspects of the entire syllabus. This question may have 4 parts and the answer should be in brief but not in Yes/No.
3. Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. All questions will carry equal marks.
4. 20% numerical problems are to be set.
5. Use of scientific (non-programmable) calculator is allowed.

Unit	Topics	Contact Hours
I	**Zeroth and First Law of Thermodynamics:** Extensive and intensive thermodynamic variables, Thermodynamic equilibrium, zeroth law and Concept of Temperature, Work and heat, State functions, First law of thermodynamics, Internal energy, Applications of first law, General relation between Cp and Cv, Work done during isothermal and adiabatic processes. **Second Law of Thermodynamics:** Reversible and Irreversible processes with examples, Conversion of Work into Heat and Heat into Work, Heat Engines, Carnot's Cycle, Carnot engine and its efficiency, 2^{nd}Law of Thermodynamics, Kelvin-Planck and Clausius statements and their equivalence, Carnot's theorem.	12
II	**Entropy and Third law of Thermodynamics:** Concept of entropy, Clausius theorem, Clausiusin equality, Second Law of Thermodynamics in terms of Entropy, Entropy of a Perfect Gas and Universe, Entropy Changes in Reversible and Irreversible Processes, Principle of increase of Entropy, Third Law of Thermodynamics, Unattainability of absolute zero, T-S Diagrams, Phase change, Classification of Phase changes.	11
III	**Thermodynamic Potentials:** Internal Energy; Definition, importance, properties andapplications of Chemical Potential, Enthalpy, Gibb's function and Helmholtz's function. **Maxwell's Thermodynamic Relations:** Derivations of Maxwell's relations and their applications: (i) Clausius-Clapeyron equation (ii) C_p- C_v value (iii) Energy equations (iv) Change of temperature during adiabatic process.	11
IV	**Real gases:** Behavior of real gases, Deviations from the ideal gas equation, The Virial equation, Critical constants. Continuity of liquid and gaseous state. Vapour and Gas, Boyle Temperature, Van-der Waal's equation of state for real gases. Values of Critical Constants. Law of corresponding states, Comparison with Experimental Curves, P-V Diagrams, Joule's Experiment, Free adiabatic expansion of a perfect gas.	11
	Practicum 1. To determine Mechanical Equivalent of Heat (J) by Callender and Barne's constant flow method.	30

	2. Measurement of Planck's constant using black body radiation. 3. To determine Stefan's Constant. 4. To determine the coefficient of thermal conductivity of copper by Searle's Apparatus. 5. To determine the Coefficient of Thermal Conductivity of Cu by Angstrom's Method. 6. To determine the coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method. 7. To determine the temperature co-efficient of resistance of Platinum resistance thermometer. 8. To study the variation of thermo emf across two junctions of a thermocouple with temperature. 9. To calibrate Resistance Temperature Device (RTD) using Null Method/Off-Balance Bridge 10. Mechanical Equivalent of heat (J) by Joule's calorimeter. **Note: Student will perform at least six experiments. The examiner will allot one practical at the time of end term examination.**	

Suggested Evaluation Methods

Internal Assessment: ➢ **Theory (20 Marks)** • Class Participation: **05 Marks** • Seminar/presentation/assignment/quiz/class test etc.:**05 Marks** • Mid-Term Exam: **10 Marks** ➢ **Practicum (10 Marks)** • Class Participation: **Nil** • Seminar/Demonstration/Viva-voce/Lab records etc.:**10 Marks** • Mid-Term Exam: **Nil**	**End Term Examination : 50 Marks** **: 20 Marks**

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Thermal Physics and Statistical Mechanics, S.K. Roy, New Age International Publishers, New Delhi
2. Thermodynamics and Statistical Physics, J.K. Sharma and K.K. Sarkar, Himalaya Publishing House, Bombay
3. Introduction to Thermodynamics and its Applications, Stowe Keith, University Press (India) Pvt. Ltd, Hyderabad
4. Introductory Thermodynamics, Pierre Infelta, Brown Walker Press, Boca Ratan, Florida
5. Fundamentals of Thermodynamics, J. K. Johnson, University of Pittsburgh2009
6. Thermodynamics and Its Applications, Jefferson Tester, Michael Modell, 3rd Edition
7. Advanced Practical Physics for students, B.L. Flint & H.T. Worsnop, 1971, Asia Publishing House.
8. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.
9. A Laboratory Manual of Physics for Undergraduate Classes, D.P. Khandelwal, 1985, Vani Publication.

Kurukshetra University Kurukshetra
Undergraduate Programs
Course: CC-M6

<table>
<tr><td colspan="4">Session: 2025-26</td></tr>
<tr><td colspan="4">Part A - Introduction</td></tr>
<tr><td>Subject</td><td colspan="3">Physics</td></tr>
<tr><td>Semester</td><td colspan="3">6th</td></tr>
<tr><td>Name of the Course</td><td colspan="3">Basic Electronics</td></tr>
<tr><td>Course Code</td><td colspan="3">B25-PHY-607</td></tr>
<tr><td>Course Type: (CC/MCC/MDC/CC-M/ DSEC/VOC/DSE/PC/AEC/VAC)</td><td colspan="3">CC-M</td></tr>
<tr><td>Level of the course (As per Annexure-I</td><td colspan="3">300-399</td></tr>
<tr><td>Pre-requisite for the course (if any)</td><td colspan="3">Appeared or passed the 3rd sem with physics as minor subject</td></tr>
<tr><td>Course Learning Outcomes (CLO):</td><td colspan="3">After completing this course, the learner will be able to:
1. Understand the operation of p-n junction, use of diode as Rectifier, voltage multiplier circuits, Zener Diode, Photo diode, solar cell, clipping and clamping circuits.
2. Familiar about Bipolar Junction Transistor, use of transistor as Amplifier in CB, CE and CC configurations.
3. Understand the concept of feedback in amplifiers, its types and effect of negative feedback on characteristics of amplifiers.
4. Analyze the operation of LC oscillators and CRO.
5. Learn to present observations, results, analysis and different concepts related to experiments of Electronics.</td></tr>
<tr><td rowspan="2">Credits</td><td>Theory</td><td>Practical</td><td>Total</td></tr>
<tr><td>3</td><td>1</td><td>4</td></tr>
<tr><td>Contact Hours</td><td>3</td><td>2</td><td>5</td></tr>
<tr><td colspan="2">Max. Marks:100
Internal Assessment Marks:30
End Term Exam Marks:70</td><td colspan="2">Time:3hrs</td></tr>
</table>

Part B-Contents of the Course

Instructions for Paper- Setter

1. Nine questions will be set in total.
2. Question no. 1 will be compulsory and based on the conceptual aspects of the entire syllabus. This question may have 4 parts and the answer should be in brief but not in Yes/No.
3. Four more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. All questions will carry equal marks.
4. 20% numerical problems are to be set.
5. Use of scientific (non-programmable) calculator is allowed.

Unit	Topics	Contact Hours
I	**Semiconductors:** Energy bands in solids, Intrinsic and extrinsic semiconductors, carrier mobility and electrical resistivity of semiconductors, Hall effect, p-n junction diode and their characteristics, Zener and Avalanche breakdown, Zener diode, Zener diode as a voltage regulator. Light emitting diodes (LED), Photoconduction in semiconductors, Photodiode, Solar Cell, p-n junction as a rectifier, half wave and full wave rectifiers (with derivation), filters (series inductor, shunt capacitance, L-section or choke, π and R.C. filter circuits).	12
II	**Transistors:** Junction transistors, Working of NPN and PNP transistors, Three configurations of transistor (C-B, C-E, C-C modes) and their V-I characteristics, transistor parameters and their relation, Advantages and disadvantages of C-E configuration, D.C. load line. Transistor biasing; various methods of transistor biasing and stabilization.	11
III	**Transistor Amplifiers:** Amplifiers, Classification of amplifiers, common base and common emitter amplifiers, coupling of amplifiers, various methods of coupling, Resistance- Capacitance (RC) coupled amplifier (two stage, concept of band width, no derivation), Feedback in amplifiers, advantages of negative feedback, emitter follower, amplifier, Noise in amplifiers.	11
IV	**Oscillators:** Damped and Undamped Oscillations, Oscillatory circuit, Principle of Oscillation, Barkhausen Criteria for sustained oscillations, Classification of oscillators: LC oscillator, Tuned collector oscillator, Tuned base oscillator, Hartley Oscillator, Colpitts's oscillator, CRO: Principle, construction and working.	11
	Practicum 1. To draw forward and reverse bias characteristics of a semiconductor diode. 2. To study the Zener diode voltage regulation characteristics. 3. To verify inverse square law using photo cell. 4. To study characteristics of a solar cell.	30

	5. To draw common base characteristics of a transistor and calculate transistor characteristics parameters. 6. To draw common emitter characteristics of a transistor and calculate transistor characteristics parameters. 7. Transistor as voltage amplifier in CB configuration. 8. Transistor as voltage amplifier in CE configuration. **Note: Student will perform at least six experiments. The examiner will allot one practical at the time of end term examination.**	
Suggested Evaluation Methods		
Internal Assessment: ➢ **Theory (20 Marks)** • Class Participation: **05 Marks** • Seminar/presentation/assignment/quiz/class test etc.:**05 Marks** • Mid-Term Exam: **10 Marks** ➢ **Practicum (10 Marks)** • Class Participation: **Nil** • Seminar/Demonstration/Viva-voce/Lab records etc.:**10 Marks** • Mid-Term Exam: **Nil**		**End Term Examination : 50 Marks** **: 20 Marks**
Part C-Learning Resources		
Recommended Books/e-resources/LMS 1. Electronic Devices and circuit theory by Boylested 2. Integrated Electronics by Jacob Millman, C. Halkias 3. Basic Electronics by B.L.Threja 4. Basic Electronics and linear circuits by N.N. Bhargav 5. Electronic Fundamentals and Applications by J.D.Ryder 6. Electronics made simple by V.K.Mehta 7. Fundamentals of Analog Electronics by J.B.Gupta 8. Analog Electronics by A.K.Maini 9. A textbook on Analog Circuits by A. Rajkumar 10. Basics of Analog Electronics by D.Prasad, Mohd. Ashrof, Z. Haseeb 11. Electronics: Analog and Digital by B. Raychaudhuri		