SRI VENKATESWARA UNIVERSITY: TIRUPATI
SVU COLLEGE OF SCIENCES
MASTER OF SCIENCES
DEPARTMENT OF PHYSICS
Re – Structured P.G Programme as per NEP – 2020, (NHEQF) And Guidelines Of APSCHE
(WEF THE BATCH ADMITTED IN THE ACADEMIC YEAR 2024-2025)
(C.B.C.S), SYLLABUS ANDSCHEME OF EXAMINATION
(WITH EFFECT FROM THE ACADEMIC YEAR 2025-2026)
M.Sc., PHYSICS

SEMESTER – I								
S.No	**Course**	**Code**	**Title of the Course**	**H/W**	**C**	**SEE**	**IA**	**Total marks**
1.	CC	PHY-101	Classical and Statistical Mechanics	4	4	70	30	100
2.		PHY-102	(A) Solid State Physics (B) Material Science	4	3	50	25	75
3.		PHY-103	(A) Electromagnetic Theory, Lasers and Modern Optics (B) Optical, Microwaves and Satellite Communications	4	3	50	25	75
4.	*P	PHY-104	Practical –I (related to CC 102 & 103)	6	2	35	15	50
5.	SOC	PHY-105	(A) Advanced Digital Electronics and Microcontrollers (B) Advanced Microprocessors and Applications	4	3	50	25	75
6.		PHY-106	(A) Mathematical Physics (B) Computational Methods and Programming	4	3	50	25	75
7.	*P	PHY-107	Practical – II (related to SOC 105 & 106)	6	2	35	15	50
			Total	**36**	**20**	**340**	**160**	**500**
8.	Audit Course	PHY-108	Indian Knowledge Systems – 1	4	0	0	100	0

- **CC** (Core Courses) – PHY-101 Core Course is mandatory and PHY-102 and PHY-103 Core Courses Student can choose one from each code.
- ***SOC** (Skill Oriented Courses) – Student can choose one from each code.
- ***Practical – I** relating to PHY-102 and PHY-103 Core Courses and **Practical - II** relating to PHY-105 and PHY-106 Skill Oriented Courses (SOC).
- **Audit Course** – Zero Credits but mandatary with only a Pass.

No	SEMESTER – II								
	Course	Code	Title of the Course	H/W	C	SEE	IA	Total marks
	CC	PHY-201	Quantum Mechanics	4	4	70	30	100
		PHY-202 (A)	Condensed Matter Physics	4	3	50		75
			Nanomaterials and Devices					
		PHY-203	Applied Spectroscopy	4	3	50		75
			Solid State Spectroscopy					
	P	PHY-204	Practical –III (related to CC 202 & 203)	6	2	35	15	50
	SOC	PHY-205	Photonics	4	3	50		75
			Vacuum and Thin Film Technology					
		PHY-206	Advanced Embedded Systems	4	3	50		75
			Solar Energy - Thermal Aspects					
	P	PHY-207	Practical – IV (related to SOC 205 & 206)	6	2	35	15	50
	OOTC	PHY-208	Open Online Transdisciplinary Course – 1	-	2	-	100	100
			Total	**36**	**22**	**340**	**260**	**600**
	Audit Course	PHY-209	Indian Knowledge Systems – 2	4	0	0	100	0

- **CC** (Core Courses) – PHY-201 Core Course is mandatory and PHY-202 and PHY-203 Core Courses Student can choose one from each code
- ***SOC** (Skill Oriented Courses) – Student can choose one from each code
- ***Practical - III** relating to PHY-202 and PHY-203 Core Courses and **Practical - IV** relating to PHY-205 and PHY-206 Skill Oriented Courses (SOC)
- ***Open Online Transdisciplinary Course (OOTC)** - Students can choose any relevant course of his / her choice from the online courses offered by governmental agencies like SWAYAM, NPTEL, etc.,
- **Audit Course** – Zero Credits but mandatary with only a Pass

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SEMESTER – III

No	Course	Code	Title of the Course	H/W	C	SEE	IA	Total marks
1.	CC	PHY-301	Advanced Quantum Mechanics	4	4	70	30	100
		PHY-302	Physics of Semiconductor Devices / IC Fabrication Technology	4	3	50	25	75
		PHY-303	Advances in Physics / Physics of Advanced Materials	4	3	50	25	75
4.	P	PHY-304	Practical –V (related to CC 302 & 303)	6	2	35	15	50
	SOC	PHY-305	Advanced Characterization Techniques / Sensors and Transducers	4	3	50	25	75
		PHY-306	Introduction to VLSI Design / Solar energy – Photo Voltaics	4	3	50	25	75
7.	P	PHY-307	Practical – VI (related to SOC 305 & 306)	6	2	35	15	50
8	OOTC/ Open Elective	PHY-308	Open Online Transdisciplinary Course – 2 **(OR)** Open Elective- Vacuum Technology and Applications	-	2	70	30	100
Seminars /Tutorials/Remedial Classes and Quiz as a part of Internal Assessment*				4	-	-	-	-
			Total	**36**	**22**	**410**	**190**	**600**

- **CC** (Core Courses) – PHY-301 Core Course is mandatory and PHY-302 and PHY-303 Core Courses Student can choose one from each code
- ***SOC** (Skill Oriented Courses) – Student can choose one from each code
- ***Practical - V** relating to PHY-302 and PHY-303 Core Courses and **Practical - VI** relating to PHY- 305 and PHY-306 Skill Oriented Courses (SOC)
- ***Open Online Transdisciplinary Course (OOTC)** - Students can choose any relevant course of his / her choice from the online courses offered by governmental agencies like SWAYAM, NPTEL, etc., / ***Open Elective**

SEMESTER – IV								
S.No	**Course**	**Code**	**Title of the Course**	**H/W**	**C**	**SEE**	**IA**	**Total marks**
	OOSDC/	PHY-401	Open Online Skill Development Courses	-	8	140	60	200
			(OR)					
	SDC (Skill Development Course)	PHY-401	(A) Mobile and Wireless Communications	4	4	70	30	100
			(B) Nuclear and Particle Physics	4	4	70	30	100
	PW	PHY-402	Project work – Orientation Classes	16	12	300	0	300
	* Conducting classes for competitive exams, communication skills, UGC / CSIR and NET / SLET Examinations			12	-	-	-	
	Total			**36**	**20**	**440**	**60**	**500**
	Total Semesters			**144**	**84**	**1320**	**880**	**2200**

- **Open Online Skill Development Course (OOSDC)** - Students can choose any **Two** relevant courses of his/her choice from the online courses offered by governmental agencies like SWAYAM, NPTEL, etc. **(OR)** Skill Development Course (SDC) **to get 8 credits (with 4 credits from each course).**

(Open Elective)

PHY-308	**Vacuum Technology and Applications**	**L-4, T-1**	**4 Credits**

Pre-requisite: Course in Vacuum Technology and Applications

Course Objectives: The objective of the course on Vacuum and Thin Film Technology is to build fundamental as well as advanced understanding in the field of vacuum and thin film technology. Students will not only learn theoretical aspects but also acquainted with latest trends in the experimental techniques as well Students will also be introduced to the theoretical background of preparation of thin films.

Course Outcomes: At the end of the course, the student will be able to

CO1	Theoretical understanding of the concept of Fundamentals of kinetic theory Applicable to vacuum technology.
CO2	Correlate observed experimental properties of thin films prepared with various techniques.
CO3	Describe appropriate theoretical model for describing behavior of thin films.
CO4	Understand the preparation of thin film technologies
CO5	Applications of thin films

Mapping of course outcomes with the program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	2	2	2	2	1	2	2	1	2
CO3	1	2	2	2	2	2	2	1	2	2	-	2
CO3	1	2	2	2	2	2	2	-	2	2	3	2
CO4	1	2	2	2	2	2	2	-	2	2	2	2
CO5	1	2	2	2	2	2	2	1	2	1	3	2

PHY- 308: Vacuum Technology and Applications

UNIT-I: Basics Principles and Production of Vacuum

Vacuum – definition – Units of Vacuum – Vacuum ranges - Kinetic theory of gases related to vacuum - Physical parameters at low pressures – Vacuum components- Production of Vacuum: Classification of vacuum pumps – Rotary pump – Diffusion pump – Turbo-molecular pump – Ion pump – Cryogenic pump.

UNIT-II: Measurement of Vacuum

Classification of vacuum gauges – McLeod gauge – Pirani gauge – Ionization gauges : Penning gauge – Bayard Alpert gauge – Measurement of partial pressure –Residual gas analyzer - Pump combinations – Construction of high vacuum coating system.

UNIT_III: Leaks & Leak Detection and Applications of Vacuum

Leaks and detection of leaks – Pressure test – Halogen leak detector – Mass spectrometric leak detection. Applications of vacuum – Vacuum metallurgy – Freeze drying – Vacuum in Electron Microscopes- Electrical discharge tubes – Space simulators.

UNIT-IV: Thin Film Technology

Introduction, Preparation of Thin Films-Physical Methods: Vacuum evaporation - Resistive heating - Electron beam evaporation-. Epitaxial deposition -Pulsed laser ablation - Molecular beam epitaxy. Sputtering: Glow discharge - DC and RF sputtering - Reactive sputtering - Magnetron sputtering.

Books for Study

1. Vacuum Technology, A.Roth, 3rd Edition, North-Holland Publications, 2012.
2. Vacuum Science and Technology, V. V. Rao, T.B. Ghosh and K.L. Chopra, 3rd Editions, Allied Publications, 2008.
3. Handbook of Thin Film Technology, L.I.Maissel and R.L.Glang, Mc Graw HillBook Co., 1970.
4. Thin Film Phenomena, K.L .Chopra, Mc Graw Hill Book Co., New York, 1969.
5. Vacuum Deposition onto Webs, Films and Foils, Charles A. Bishop, Elsevier, London, 2015
6. The Materials Science of Thin Films, M. Ohring, Academic Press, New York, 1992.
7. The User's Guide to Vacuum Technology, J.F. O'Henlon, John Wiley & Sons, 2003.

PHY-401 (A)	**Mobile and Wireless Communications**	**L-3, T-1**	**4 Credits**

Pre-requisite: Understanding of Mobile and Wireless Communications

Course Objectives: The aim and objective of the course on Mobile and Wireless Communications is to familiarize the M.Sc. students with the basics of the recently emerging mobile technologies.

Course Outcomes: At the end of the course, the student will be able to

CO1	Understand various generations of mobile communications and the concept of cellular communications
CO2	Understand the basics of digital modulation techniques
CO3	Know GSM mobile communication standards, its architecture, logical channels, advantages and limitations.
CO4	Understand various coding and error correction techniques
CO5	Understand the concepts of wireless networks

Mapping of course outcomes with the program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9		PO10	PO11	PO12
CO1										2	2	1	2
CO2										2	2	1	2
CO3										2	2	1	2
CO4										2	2	1	2
CO5										2	2	1	2

PHY-401 (A): Mobile and Wireless Communications UNIT – I:

Base Band Data Transmission and Digital Modulation techniques: BPSK, QPSK, DPSK, QASK, BFSK, MSK, M-Ary techniques. Base band binary data transmission system – Inter symbol interference – Nyquist pulse shaping criteria.

UNIT – II:

Codes for Error Detection and Correction, Linear block codes, Convolutional codes. Encoding, Decoding of convolutional codes, State, Tree and Trellis diagrams. Maximum likelihood – Viterbi algorithm, Burst error correction.

UNIT – III:

Introduction to Wireless Communication Systems, Global system for mobile (GSM): cellular concept, system design. Transmission system, receiving system; frequency re-use; Spread spectrum

modulation; Multiple access techniques as applied to wireless communications; 1G, 2G, 3G, 4G and 5G wireless networks.

UNIT-IV :

Wireless Networks: Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard, Wireless PANs, Hiper Lan, WLL.

Books for Study

1. Modern Digital and Analog communication system by B.P. Lathi: Oxford 3rd ed., 2011
2. Digital Communications Fundamentals and Applications by Bernard Sklar, Sklar Person Education, 2008
3. Principles of Communication Systems: Taub & Schilling, Tata McGraw-Hill, 1991
4. Principles of Communication, R.E. Ziemer, WH Tranter Fifth Edition John Wiley (fifth module)
5. Wayne Tomoasi: Morden Electronic Communication Systems. Person Education/PHI,2014
6. John G Proakis : Digital Communication. MGH
7. Digital Communication Techniques Simon, Hindey Lindsey PHI
8. Communication Systems: Simon Haykin, John Wiley & Sons. Pvt. Ltd.
9. Digital and Analog Communication System: K Sam Shanmugam. John Wiley
10. Communication Systems Engineering: Proakis, Pearson Education
11. Digital & Analog Communication System – Leon W Couch, Pearson Education/PHI.
12. Analog and Digital Communication M S Roden PHI
13. Digital modulation and coding. Wilson, Pearson Education
14. Applied coding and information Theory for engineers, Wells, Pearson education.

PHY-401(B)	Nuclear and Particle Physics	L-4, T-1	4 Credits

Pre-requisite: Understanding of Nuclear and Particle physics

Course Objectives: The aim and objective of the course on Nuclear and Particle Physics is to familiarize the students of M.Sc. class to the basic aspects of Nuclear Physics like static properties of nuclei, radioactive decays, nuclear forces, nuclear models, and nuclear reactions so that they are equipped with the techniques used in studying these things.

Course Outcomes: At the end of the course, the student will be able to

CO1	Understand and compare nuclear models and explain nuclear properties using nuclear models.
CO2	Understand structure and static properties of nuclei.
CO3	Analyse various decay mode of nucleus.
CO4	Use nucleon-nucleon scattering and deuteron problem to explain nature ofnuclear forces.
CO5	Discuss the concepts of Elementary Particles

Mapping of course outcomes with the program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
CO1										1			
CO2										1			
CO3										1			
CO4										1			
CO5										1			

PHY 401(B): Nuclear and Particle Physics UNIT – I:

Nuclear Forces

Characteristics of nuclear forces –Deuteron: Ground state of Deuteron (No excited S – states), Excited state of Deuteron – Low energy Neutron – Proton scattering and Proton – Proton scattering – Meson theory of nuclear forces.

UNIT – II: Nuclear Decays

Nuclear transformations – Radioactive decay – Alpha decay – Gamow's theory – Beta decay – Fermi theory –Selection rules – Interaction of gamma radiation with matter – Photo electric effect – Compton scattering – Pair production.

UNIT – III: Nuclear Reactions and Reactors

Nuclear Reactions: Types of nuclear reactions – Conservation Laws-Compound nuclear reactions – Nuclear cross section – Resonance theory – Briet Wigner formula.

Nuclear Reactors: Nuclear Fission and Fusion reactions – Nuclear chain reactions – Four factor formula – The critical size of a reactor – General aspects of reactor design – Classification of reactors – Power reactors: Liquid Fuel Reactor.

UNIT – IV: **Elementary Particles**

Discovery and classification of elementary particles – Types of interactions – Conservation laws – Iso-spin, parity, charge conjugation – Time reversal – CPT theorem – Properties of leptons, mesons and baryons – Elementary particle symmetries (SU_2 and SU_3 symmetries) – Quark model – Search for Higg's particle – elementary ideas.

Book for Study

1. Nuclear Physics, Irving Kaplan, Narosa Pub. (1998).
2. Nuclear Physics, Theory and experiment – P.R. Roy and B.P. Nigam, New Age Int.1997.
3. Atomic and Nuclear Physics (Vol.2), S.N. Ghoshal, S. Chand & Co. (1994).
4. Nuclear Physics, D.C. Tayal, Himalaya Pub. (1997).
5. Atomic and Nuclear Physics, R.C. Sharma, K. Nath & Co., Meerut (2007).
6. Nuclei and Particles, E. Segre, W A Benjamin. Inc., (1965).
7. Introduction to Nuclear Physics, H.A. Enge, Addison Wesley (1975).
8. Introduction to Nuclear Physics, K.S. Krane, John Wiley &Sons (1988).

Model Question Paper

M.Sc. DEGREE EXAMINATION - APRIL/DECEMBER SEMESTERS

Branch - PHYSICS

Paper code and Title

(*Common syllabus for SVU & Affiliated Colleges*)

(w.e.f.2024-2025)

Time : 3 Hours **Max. Marks 70**

SECTION-A

Answer any **FOUR** of the following questions. (**4 × 5=20**)
Each question carriers **5** marks.

1. Unit-I
2.
3. Unit-II
4.
5. Unit-III
6.
7. Unit-IV
8.

SECTION – B

Answer **ALL** questions. Each question carriers **12½** marks (**4 x 12½ = 50**)

9. (a)

(OR) Unit-I

(b)

10. (a)

(OR) Unit-II

(b)

11. (a)

(OR) Unit-III

(b)

12. (a)

(OR) Unit-IV

(b)