SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

SEMESTER PATTERN CURRICULUM UNDER

CHOICE BASED CREDIT SYSTEM (CBCS) FOR

Faculty of Science

Under Graduate (UG) Program

SUBJECT: PHYSICS

(w. e. f. Academic Year 2016-2017)

Salient Features of B. Sc. Physics (CBCS) Curriculum

Several initiatives have been taken by the SRTM University, Nanded time to time to upgrade and enhance the academic excellence, examination reforms and developing the skilled minds and skilled hands. The semester and CGPA pattern has been adopted in 2014. Now the university is going one step ahead to adopt and implement the Choice Based Credit System (CBCS) semester pattern to Undergraduate program run by various colleges affiliated SRTM University, Nanded. As per the initiatives led by University the syllabi of B. Sc. Physics (CBCS Semester Pattern) has been finalized and effectively implemented from academic year June, 2016. The Syllabi is framed as per the guidelines given in the UGC and SRTMU CBCS Semester pattern. The numbers of objectives are taken in to consideration while reforming the syllabi.

The main objective is to create skilled minds and therefore understanding of theoretical and mathematical knowledge essential for finding solutions of various interacting physical phenomenon, the full paper on mathematical methods in physics is included. It helps in general to improve scientific attitude to solve the research oriented problems, problems of interacting systems. The introduction of Sci Lab is introduced in the practical course work to upgrade the computer knowledge and develop the skill to solve the various mathematical problems.

The professional Education of the students begins while enrolling their names in the B. Sc. Classes. The Board of study thought authentically that some sort of Job oriented syllabi is to be included and accordingly, some principles of cooling and liquification of gasses, some part of thermodynamics, theoretical physics, AC current, part of industrial electronics, digital electronics, communication system, TV, Lasers, detectors, nuclear energy, solar energy and various aspects of physics related to the industries and research field has been covered. The lab work also includes theory based practical to develop the

skill and create interest of the students in the subject physics. To enhance the students knowledge and create the skill among them some sort of skill courses has been introduce as per the initiatives taken by the UGC. The number of Elective papers has been included in semester fifth and sixth for upgrading interest status and to giving broad choice to the interesting students.

The CBCS Structure of B. Sc. Curriculum in subject Physics and B. Sc. First Year Physics syllabus has been finalized unanimously in the BOS physics Meeting held on 12/4/2016 at SRTM University Nanded as per the University initiatives.

Chairman BOS Physics SRTM University Nanded

Dr. L. S. Ravangave

Distribution of credits for B.Sc. Physics (optional)
Under Faculty of Science
B. Sc. Syllabus structure
Semester Pattern effective from June 2016
Subject: Physics

CLASS: B. Sc. First YEAR

Semester I&II

Semester	Paper No.	Name of the Course	Instruction Hrs/	Total period	ESE	C. A.	Total Marks	Credits
I	CCP I (Section A)	Mechanics and Properties of Matter (P-I))	03	45	40	10	50	2
	CCP I (Section B)	Mathematical Methods in Physics (P-II)	03	45	40	10	50	2
II	CCP II (Section A)	Heat and Thermodynamics (P-III)	03	45	40	10	50	2
	CCP II (Section B)	Electricity and Magnetism (P-IV)	03	45	40	10	50	2
	CCP P I	P-V :Practical's based on Section A & Section B of CCP-I & CCP-II	04	15 Practical	80	20	100	4
	Total credits semester I and II: 12							

ESE: End of Semester Marks C. A.: Continuous Assessment (Internal)

CLASS: B. Sc. SECOND YEAR

Semester III& IV

Semester	Paper No.	Name of the Course	Instruction Hrs/ week	Total period	ESE	C. A.	Total Marks	Credits
III	CCPIII (Section A)	Waves and Oscillations (P-VI)	03	45	40	10	50	2
	CCP III (Section B)	Statistical physics, Electromagnetic Theory and Relativity (P-	03	45	40	10	50	2
	CCPP II (Annual Pattern Section A)]	P-X: Practical's based on P-VI & P-VIII	04		40	10	50	2
	CCP II (Section B)	SEC I (1 Skill/ optional)			-	15×3 = 45	-	(02)*
IV	CCP IV (Section A)	Basic Electronics (P-VIII)	03	45	40	10	50	2
	CCPIV (Section B)	Optics and Lasers (P-IX)	03	45	40	10	50	2
	CCPP III (Annual Pattern Section A)	P-XI : Practical's based on P-VII & P-IX	04	10 practical	40	10	50	2
	CCPP III (Section B)	SEC II (1 Skill / optional)			-	15×3 = 45	-	(02)*
Total credits semester III and IV								12(04)*

ESE: End of Semester Marks C. A.: Continuous Assessment (Internal)

CLASS: B. Sc. THIRD YEAR

Semester V&VI

Semester	Course No.	Name of the Course	Instruction Hrs/ week	Total period	ESE	C. A.	Total Marks	Credits
V	DECP I (Section A)	Quantum Mechanics (P-XII)	03	45	40	10	50	2
	DECPI I [(Section B) Elective]	Solid State Physics Or Solar Energy Or Astrophysics Or Nuclear and Radiations Physics (P-XIII)	03	45	40	10	50	2
	DECPP I (Annual Patten Section A)	P-XVI :Practical's based on P- XII & P-XIII	04	10 Practical	40	10	50	2
	DECPP I (Section B)]	SEC III (1 Skill/ optional)			-	15×3 = 45	-	(02)*
VI	DECP II (Section A)	Atomic and Molecular physics (P-XIV)	03	45	40	10	50	2
	DECP II [(Section B) Elective]	Digital and Communication Electronics Or Linear and Digital Integrated Circuits Or Fibre optic communication Or Bio Physics (P-XV)	03	45	40	10	50	2
	DECPP II (Annual Pattern Section A)	P-XVII: Practical's based on P- XIII & P-XIV	04	10 Practical	40	10	50	2
	DECPP II (Section B)	SEC IV (Project))	03		5O	-	50	(2)*
Total credits semester V and VI								12(04)*

ESE: End of Semester Marks C. A.: Continuous Assessment (Internal)

Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure (New scheme)

B. Sc. First year (Semester- I)

Semester Pattern effective from June -2016

Physics

CCP I (Section A)

***Mechanics and Properties of Matter* (P-I)**

Credits: 02 (Marks: 50) **Periods: 45**

Unit I: Mechanics (15 Periods)

Frames of reference, Laws of Mechanics (Newton's Laws of motion), inertial frame of reference, Centre of Mass. Conservation of momentum. Work, energy work energy Theorem, Conservation of energy, Angular velocity and angular momentum, Angular Momentum and Torque, Conservation of angular momentum,

Newton's law of Gravitation, Keplar's laws of Planetary Motion , Keplar's deduction from Newton's laws, Gravitational Field, Gravitational Intensity, Gravitational Potential, Gravitational Potential energy ,Potential and field Intensity due to uniform Solid Sphere at a point (Point inside and outside).

Unit–II: Surface Tension (08 Periods)

Definition of Surface Tension, Curvature pressure and Surface Tension, Difference of pressure on two sides of liquid surface, Expression for Excess Pressure inside a Spherical Drop and spherical Soap Bubble, Surface Tension by Jaeger's Method, Surface Tension by Ferguson Method.

Unit- III: Viscosity (10Periods)

Introduction, Coefficient of Viscosity, Streamline flow, critical velocity, Bernoulli's theorem, (Kinetic energy, Potential energy, Pressure energy) Poiseuille's equation for the flow of liquid through a tube, Determination of coefficient viscosity by Poiseuille's Method.

Unit- IV: Elasticity (12 Periods)

Definition of three types of Elastic stress and Strains, Deformation of cube (Bulk Modulus),Modulus of Rigidity and Young's modulus, Relation connecting elastic constants, Twisting couple on a cylinder or a (wire), Tensional pendulum.

Bending of Beam, Bending Moment, Cantilever (Weight of the beam is ineffective, Weight of the beam is effective), Depression of a Beam supported at the ends and loaded at the centre, Determination of Y by bending of beam.

Books Recommended:

1. Elements of Properties of Matter –D.S.Mathur, Shamlal Charitable trust, New Delhi.

2. General Properties of Matter – J. C. Upadhyaya, Ram Prasad & Sons, Agra.

3. Mechanics- J. C. Upadhyaya, Ram Prasad & Sons, Agra.

CCP I (SectionB)

Mathematical Methods In Physics (P-II)

Credits: 02 (Marks: 50) **Periods: 45**

Unit–I: Vector Analysis (15 Periods)

Vector triple product, Scalar triple product, Vector identity, Scalar and vector field , Gradient of a scalar field , Divergence of a vector field and Curl of a vector field and their Physical interpretation , Laplacian Operator (∇^2), Line integral, Surface integral, Volume integral, Gauss's divergence theorem, Stoke's theorem, Green's theorem (Statements only).

Unit II: Complex variables (10 Periods)

Introduction, Definition, complex algebra (Addition, Subtraction, Multiplication, Division, conjugate complex number), Argand diagram, Graphical representation of Sum, Difference, product and Quotient of complex number, Extraction of Roots, Properties of moduli ,arguments and geometry of complex numbers, , Rectangular, polar and exponential form of complex numbers.

Unit –III: Partial Differentiation (10 Periods)

Definition of Partial Differentiation, total Differentiation, and Chain rule, Order of Differentiation, Change of variables from Cartesian to Polar Co-ordinates, Implicit, Condition for maxima and minimum (without proof), **Solutions Some Partial Differential Equations**: Solutions to partial differential equations, using separation of variables: Laplace's Equation in problems of spherical symmetry, rectangular symmetry.

Unit -IV: Fourier Series (Book 9, 10) (10 Periods)

Definition, Evaluation of the coefficients of Fourier series, Cosine series, Sine series, Dirichlet's Conditions, Graphical representations of even and odd functions, Physical applications of Fourier series analysis, Square wave, Half wave Rectifier,

Books Recommended:

1. Vector Analysis - Murray R. Spigel
2. Mathematical Physics - B.S. Rajput
3. Mathematical Physics- B.D. Gupta (Vikas publishing House)
4. Methods of Mathematical Physics by Laud Talbout and Gambhir
5. Mathematical methods in Physical Sciences- Masy and Bias.
6. Mathematics For Engineers and Physists - Pipe

Swami Ramanand Teerth Marathwada University Nanded
Choice Based Credit System (CBCS) Course Structure (New scheme)
B. Sc. First year (Semester – II)
Semester Pattern effective from June -2016
Physics
CCP II (Section A)
Heat *and Thermodynamics* (P-III)

Credits: 02 (Marks: 50) **Periods: 45**

Unit–I: **Kinetic Theory** (**9 Periods)**

Mean free path, Transport Phenomena, Viscosity of Gases, Thermal Conductivity of Gases, Diffusion, Inter relation between three transport coefficients.

Unit –II : Low Temperature Physics (12Periods)

Andrew's Experiment on CO_2, Amagat's Experiment, Behavior of Gases at high pressure, Porous Plug Experiment, Vander wall's Equation of State, Critical Constants, Corresponding states, Coefficients of Vander wall's Equation, Boyles temperature, Temperature of Inversion Relation between Boyles temperature and Temperature of Inversion, Reduced Equation of State, properties of matter near critical point.

Unit–III: Thermodynamics (12Periods)

First Law of Thermodynamics, Relation connecting P, V and T in an Adiabatic Process, Second Law of Thermodynamics (Kelvin and Clausius statements), Carnot's cycle, Carnot's heat Engine , Carnot's Theorem, Entropy , Entropy of Irreversible processes, entropy of reversible process Third Law of Thermodynamics.

Thermodynamic Relations : Maxwell's Thermodynamical Relations, T- ds equations, Clausius-Clapeyron latent heat equations, Internal energy, Helmholtz' function, Enthalpy, Gibb's function

Unit-IV: Theory of Radiation (12Periods)

Blackbody radiation, Spectral distribution, Concept of Energy Density, Derivation of Planck's law, Deduction of Wien's distribution law, Rayleigh- Jeans Law, Stefan Boltzmann Law and Wien's displacement law from Planck's law.

Books Recommended:

1. Heat and Thermodynamics – Brij Lal, N.Subrahmanyam, P. S.Hemne For B. Sc. Students as per UGC Model Syllabus, Sultan Chand & Company Ltd.
2. Heat and Thermodynamics – D.S.Mathur, Sultan Chand & Sons, New Delhi
3. Thermodynamics and Statistical Physics – S.L.Kakani
4. Thermodynamics, Kinetic Theory, and Statistical Thermodynamics – Sears and Salinger, Narosa Publishing House, New Delhi.

Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure (New scheme)

B. Sc. First year (Semester – II)

Semester Pattern effective from June -2016

Physics

CCPII(Section B)

Electricity and Magnetism (P-IV)

Credits: 02 (Marks: 50) **Periods: 45**

Unit–I :Basic Electricity Principles And AC Currents (15 Periods)

Voltage, Current, Resistance, and Power. Ohm's law.Series, parallel, and series-parallel combinations. AC Electricity and DC Electricity. Familiarization with multimeter, voltmeter and ammeter.

AC through LCR circuit, (series resonance and Parallel Resonance circuits) Complex numbers and Their Applications in solving AC Circuit Problems, Complex Impedance and Resistance, Power in AC circuit Power Factor, Choke, Transformer Principle, with current and voltage ratios; Efficiency of transformer Types of Transformers: step down and Step up, Power loss In Transformer, AC bridge, Owns Bridge.

Unit- II: Electromagnetic Induction (10 Periods)

Definition, Faradays Law of Electromagnetic Induction, Self induction, self induction of a Solenoid, Mutual induction, Mutual Induction of a pair of coil, Work done in Establishing Current in an Inductance, Mutual inductance of a Co axial Solenoids, Problems.

Unit- III: Magnetization (10 Periods)

Introduction, Magnetic Induction, Intensity of magnetization, Permeability, Susceptibility, Relation between Permeability and Susceptibility, Hysteresis curve, I-H curve By magnetometer Method, Moving coil type Ballistic Galvanometer, logarithmic decrement, damping correction,

Unit- IV: Magnetostatics : (10Periods)

Definition of Magnetic Field, Lorentz Force, Force on a Current Carrying Conductor, Magnetic Dipole Moment, Biot And Savert Law, and Its Applications to straight conductor, Circular coil, Amperes Circuital Law and its Curl.

Books **Recommended:**

1. Foundations of Electromagnetic theory- Reitz,Milford,Christey
2. Electricity and Electronics – D.C.Tayal (Himalaya Publishing House, Mumbai)
3. Introduction to Electrodynamics – D.G. Griffith
4. Electricity and Magnetism - Brij Lal, Subramanyan (Ratan Prakashan Mandir,Twentieath revised and enlarged edition 1997)
5. Electricity and Magnetism – Khare, Shrivastav (Twentieath revised 1997)

Practical Paper: CCPP-I (P-V)
(Annual practical Based on [CCPI & II (Section A & B))

Credits: 04 (Marks: 100)

1. Y- by Spiral spring.

2. **η** - by Spiral spring.

3. **η** - by Static torsion.

4. **η** - by Maxwell's needle.

5. Y- by bending loaded at the middle.

6. Viscosity of given liquid by Poiseuille's method.

7. Surface Tension of liquid by Jaeger's method.

8. Determination of Viscosity of given liquid by Searle's Viscometer.

10. Thermal conductivity by Searle's method

11. Thermal conductivity by Forbe's Method.

12. Study of Emf developed across the thermocouple junction

13. Small resistance by Carry Fosters Bridge.

14. Field along the axis of Circular coil (Determination of radius of the coil)

15. Ballistic galvanometer (Figure of merit)

16. Comparison of capacity by Desouty Method

17. Earth Inductor Determination of horizontal component of Magnetic field.

18 Introduction to Scilab, Advantages and disadvantages, Scilab environment, Command window, Figure window, Edit window, Variables and arrays, Initialising variables in Scilab,

19 Solving Simple Operations: Addition Subtraction, Multiplication and division

20 Addition and subtractions of simple complex numbers using Sci lab software

21. Solving solution to first order differential partial differential equation using computer software (Sci Lab)

The aim of this Lab is to use the computational methods to solve physical problems. The course will consist of lectures (both theory and practical) in the Computer Lab. Evaluation done not on the basis of programming but on the basis of formulating the problem. Each student appearing for examination must produce a journal showing that he has completed not less than **12** experiments during the year out of them tow may be of computer lab.