GOVERNMENT OF KARNATAKA

DEPARTMENT OF COLLEGIATE EDUCATION

GOVERNMENT COLLEGE (AUTONOMOUS)

KALABURAGI – 585 105

[ACCREDITED BY NAAC WITH 'A' GRADE]

BoS Approved copy of the Syllabus of

M.Sc. in Physics Course (CBCS) w.e.f. 2018-19

Department of Postgraduate Studies in Physics

Approved by Academic Council

PRINCIPAL
Govt. College
Kusnoor Road, GULBARGA-585 105

Government College (Autonomous), Kalaburagi

Course Structure for Master of Science Programmes

Name of the Master Degree: **M.Sc. in Physics**

Course Code	Title of the Course	Total Credits	Teaching Hours / week	Marks Allocation					Total Max. Marks
				Internal		Semester end Exam			
				Max. Marks	Minimum Marks	Duration	Max. Marks	Minimum Marks	
Semester – I									
CCT1.1	Classical Mechanics	4	4	20	--	3 hrs	80	32	100
CCT1.2	Condensed Matter Physics	4	4	20	--	3 hrs	80	32	100
CCT1.3	Electrodynamics	4	4	20	--	3 hrs	80	32	100
DSET1.1 a) / DSET1.1 b)	Mathematical Methods of Physics / Fundamentals of Astrophysics	4	4	20	--	3 hrs	80	32	100
Practical 1.1	Practical 1.1	4	8	20	--	4 hrs	80	32	100
Practical 1.2	Practical 1.2	4	8	20	--	4 hrs	80	32	100
	Total	24							600
Semester – II									
CCT2.1	Quantum Mechanics - I	4	4	20	--	3 hrs	80	32	100
CCT2.2	Nuclear & Particle Physics	4	4	20	--	3 hrs	80	32	100
DSET2.1 a) / DSET2.1 b)	Statistical Mechanics / Plasma Physics	4	4	20	--	3 hrs	80	32	100
GET2.1	Modern Physics	4	4	20	--	3 hrs	80	32	100
Practical 2.1	Practical 2.1	4	8	20	--	4 hrs	80	32	100
Practical 2.2	Practical 2.2	4	8	20	--	4 hrs	80	32	100
	Total	24							600

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Semester – III									
CCT3.1	Quantum Mechanics - II	4	4	20	--	3 hrs	80	32	100
CCT3.2	Electronics & Experimental Methods in Physics	4	4	20	--	3 hrs	80	32	100
DSET3.1 a) / DSET3.1 b)	Biophysics I / Nanophysics I	4	4	20	--	3 hrs	80	32	100
GET3.1	Applied Physics	4	4	20	--	3 hrs	80	32	100
Practical 3.1	Practical 3.1	4	8	20	--	4 hrs	80	32	100
Practical 3.2	Practical 3.2	4	8	20	--	4 hrs	80	32	100
	Total	24							600
Semester – IV									
CCT4.1	Atomic & Molecular Physics	4	4	20	--	3 hrs	80	32	100
CCT4.2	Materials Physics	4	4	20	--	3 hrs	80	32	100
DSET4.1 a) / DSET4.1 b)	Biophysics II / Nanophysics II	4	4	20	--	3 hrs	80	32	100
Practical 4.1	Practical 4.1	4	8	20	--	4 hrs	80	32	100
Practical 4.2	Practical 4.2	4	8	20	--	4 hrs	80	32	100
CCPR 4.1	PROJECT WORK	6	6	30	--	--	120	48	150
	Total	26							650

CCT – Core Course Theory DSET – Discipline Specific Elective Theory GET – General Elective Theory CCPR 4.1 – Project Work

In the beginning of the Semester III & IV, the Department will notify the actual DSET course that it wants to offer depending on the availability of staff and facility. Accordingly, the students will be allotted the DSET Course.

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M.Sc. Physics – Semester I
CCT 1.1: CLASSICAL MECHANICS

Unit 1: Newtonian Mechanics **[16 hours]**

Mechanics of system of particles: Centre of mass, total angular momentum and total kinetic energy of the system of particles, conservation laws for linear momentum, angular momentum and energy.

Motion in a central force field: Equivalent one –body problem, reduced mass of the system, equation of motion and first integrals, The Kepler problem: inverse-square law of force, scattering cross-section, impact parameter, Rutherford scattering, centre of mass and laboratory co-ordinate systems and transformations.

Unit 2: Lagrangian Formalism **[16 hours]**

Constraints and their classification, degrees of freedom, generalized co-ordinates, principle of virtual work, D'Alemberts principle, Lagrange's equations of motion, Newton's laws of motion from Lagrange's equations, simple applications.

Symmetries of space and time and their connection with conservation laws, cyclic co-ordinates, Hamilton's variational principle and Lagrangian equations of motion from variational principle,

Unit 3: Hamiltonian Formalism **[16 hours]**

Hamilton's equations from variational principle and Legendre transformation, Hamiltonian and its physical significance, application of Hamiltonian formulation to harmonic oscillator and simple pendulum (with and without moving support).

Canonical transformations: generating functions, Poisson brackets and their properties, canonical equations in terms of Poisson bracket notation, angular momentum Poisson brackets, invariance under canonical transformations, Noether's theorem, Hamilton-Jacobi equation and its application to harmonic oscillator problem.

Unit 4: Rigid Body Dynamics **[16 hours]**

Angular momentum and kinetic energy of a rigid body, moment of inertia tensor, classification of rigid bodies as spherical, symmetric and asymmetric, Euler's equation of motion, motion of a symmetric top.

Relativistic mechanics: Four dimensional formulations: four-vectors, four-velocity, four-momentum and four-acceleration, Lorentz covariant form of equation of motion.

References:

1. Introduction to Classical Mechanics - R G Takwale and P S Puranik (Tata Mcgraw Hill, 1983)
2. Classical Mechanics - H Goldstein (Addison Wesley, 1980)
3. Classical Mechanics - N C Rana and P S Joag (Tata Mcgraw Hill, 1991)
4. Classical Mechanics of Particles and Rigid Bodies - Kiran C. Gupta (*New Age International Publishers*)
5. Classical Mechanics - JC Upadhyaya (*Himalya Publishers*)
6. Mechanics - A Sommerfeld (Academic Press, 1952)

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