FACULTY OF SCIENCES

Syllabus of Physics for

Master of Science (FYIP) Mathematics

(Credit Based Continuous Evaluation Grading System)

(Semester I& II)

Session: 2024-25

The Heritage Institution

KANYA MAHA VIDYALAYA JALANDHAR (Autonomous)

Master of Science (FYIP) Mathematics Semester–I&II
(Session 2024-25)

Semester-I								
Course Code	Course Name	Course Type	Credits L-T-P	Marks				Examination time (in Hours)
				Total	Ext.		CA	
					L	P		
FMAM-1395	Mechanics-I	C	3-0-1	100	40	30	30	3
Semester-II								
FMAM- 2395	Mechanics-II	C	3-0-1	100	40	30	30	3

Master of Science (FYIP) Mathematics Semester–I
(Session 2024-25)
Course Name: Mechanics-I
Course Code: FMAM-1395

Course Outcomes:

After passing this course, students will be able to:

CO1: Understand the various coordinate systems and their applications. Students will learn the applications of Newton's laws of motion in various situations such as variable mass systems.
CO2:They will understand the elastic scattering in the lab and centre of mass systems. They will learn the rotational motion of a body in general by studying Euler's equations and the Moment of inertia tensor.
CO3: Know the fundamental forces of nature, the concept of centre mass, central forces and the motion of particles under central force and to determine the turning points of orbit. They will be able to understand planetary motion by solving differential equations of orbits and studying Kepler's laws.
CO4: They will learn Galilean transformations and understand the origin of fictitious forces in non-inertial frames. They will understand the consequences of fictitious forces on acceleration due to gravity, motion of a particle on earth, and Foucault's pendulum.

Master of Science (Semester System) (12+5 System of Education with multiple Entries and Exits)

(Session-2024-25)

Master of Science (FYIP) MATHEMATICS (SEMESTER–I)

COURSE TITLE: MECHANICS-I

COURSE CODE: FMAM-1395

Credits: 3-0-1 **Max Marks: 100 {ESE Marks: (Theory 40, Practical 30, CA: 30}**

Examination Time: 3 Hours **Pass Mark: 14**

Instructions for the Paper Setters:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. Each question carries 14 marks.

Note: Students can use Non-Scientific calculators or logarithmic tables.

Unit I

Reference frames, Inertial frames, Displacement, velocity & acceleration in Cartesian, Plane polar, and Spherical polar coordinate systems, Area and volume in these coordinate systems. Solid angle. Review of Newton's Laws of Motion, Momentum of variable-mass system: motion of the rocket.

Unit II

Elastic and inelastic collisions in laboratory and centre of mass systems; velocities, angles, energies in these systems and their relationships. Rotational motion of the rigid body, Torques due to internal forces, angular momentum about the centre of mass, Principal axes and inertia tensor, Kinetic energy of rotation, Euler's equations,

Unit III

Forces in nature (Qualitative). Conservative forces. Central Forces. Motion of a particle under a central force field, Two-body problem and its reduction to one-body problem and its solution, Reduced mass, Equation of motion of a reduced mass under central force and energy. Differential equation of the orbit, Equation of orbit under inverse square force field, turning points, Kepler's Laws.

Unit IV

Galilean transformations; Galilean invariance of space &time intervals, Newton's laws of motion and conservation laws. Non-inertial frames, Fictitious forces. Effect of rotation of the earth on'g'. Effects of centrifugal and Coriolis forces produced as a result of earth's rotation. Foucault's pendulumandits equation of motion.

BooksRecommended:

1.Knight,W.D.,Ruderman,M.A.,Helmholtz,C.A.andMoyer,R.J.,BerkeleyPhysicsCourse,Vol.I Mechanics

2. Halliday, D., Resnick, R., and Walker, J., Fundamentals of Physics, 6Edition, Wiley India Pvt.Ltd,NewDelhi, 2004.

3. Gupta,S.K.,Analytical Mechanics,ModernPublishers.AnIntroductiontoMechanics,DanielKleppner &Robert Kolenkow, TataMcGrawHillPublishingCompanyLtd., NewDelhi.

4. Feynman, R.P., Leighton, R. and Sands, M., The Feynman Lectures in Physics, The New MillenniumEdition,Basic Books, Vol.I, Mechanics,

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(Session-2024-25)
Master of Science (FYIP) MATHEMATICS (SEMESTER–I)
COURSE TITLE: MECHANICS-I (Practical)
COURSE CODE: FMAM-1395 (P)

COURSE OUTCOMES:

After passing this course, students will be able to:

CO1: to conduct a specific experiment from a given list, applying theoretical knowledge and practical skills to accurately complete the procedure and obtain reliable results.

CO2: to articulate the theoretical background and principles underlying the chosen experiment.

CO3: demonstrate their understanding of the experiment through oral questioning and discussion.

CO4: well-organized and accurate practical file documenting all experiments conducted.

Master of Science (Semester System) (12+5 System of Education with multiple Entries and Exits)

(Session-2024-25)
Master of Science (FYIP) MATHEMATICS (SEMESTER–I)
COURSE TITLE: MECHANICS Lab-I
COURSE CODE: FMAM-1395

Credits: 0-0-1 **Max Marks: 30**
Examination Time: 3 Hours **Pass Mark: 11**

Instructions to Practical Examiner

Question paper is to be set on the spot jointly by the external and internal examiners. Two copies of the same to be submitted for the record to COE office, Kanya Maha Vidyalaya, Jalandhar

General Guidelines for Practical Examination

The distribution of marks is as follows :

i) One experiment 10 Marks
ii) Brief Theory 7 Marks
iii) Viva–Voce 7 Marks
iv) Record (Practical file) 6 Marks

II. There will be one session of 2 hours duration. The paper will have one session. Paper will consist of 5 experiments, out of which an examinee will mark 4 experiments and one of these is to be allotted by the external examiner.

III. The number of candidates in a group for practical examination should not exceed 12.

IV. In a single group, no experiment should be allotted to more than three examinees.

LIST OF EXPERIMENTS

1. To determine the value of acceleration duetogravityataplacewithKater'spendulum.
2. To Find The Moment of Inertia of a flywheel.
3. To find the moment of inertia of an irregular body about an axis through its center of gravity with torsion pendulum.
4. To study the dependence of moment of inertia on distribution of mass (by noting time periods of oscillations using objects of various geometrical shapes but of same mass)
5. Study of bending of beams and determination of Young’s modulus.
6. Determination of Poisson’s ratio for rubber.

Master of Science (Semester System) (12+5 System of Education with multiple Entries and Exits)

(Session-2024-25)

MASTER OF SCIENCE (FYIP) MATHEMATICS (SEMESTER–II)

COURSE TITLE: MECHANICS-II

COURSE CODE: FMAM-2395

Course Outcomes

On passing this course the students will be able to

CO1: understand the concepts of relativity and frames of references

CO2: Understand the basic ideas and scope of probability as well as distribution of n particles in different compartments.

CO3: understand and apply the concepts of phase space and different types of statistics

CO4: Know applications of different statistics in various physics concepts

Master of Science (Semester System) (12+5 System of Education with multiple Entries and Exits)

(Session-2024-25)

MASTER OF SCIENCE (FYIP) MATHEMATICS (SEMESTER–II)

COURSE TITLE: MECHANICS-II

COURSE CODE: FMAM-2395

Credits: 3-0-1 **Max Marks: 100 {ESE Marks: (Theory 40, Practical 30, CA: 30}**

Examination Time: 3 Hours **Pass Mark: 14**

Instructions for the Paper Setters:

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section. Each question carries**12 marks**.

UNIT-I

Concept of stationary universal frame of reference and ether, Michelson-Morley experiment, postulate of special theory of relativity, Lorentz's transformations, relativity of simultaneity, length contraction, time dilation relativistic addition of velocities, variation of mass with velocity and mass energy equivalence.

UNIT-II

The statistical basis of thermodynamics: Probability and thermodynamic probability; principle of equal a priori probabilities, probability distribution, its narrowing with increasing n, average properties, fluctuations, micro and macro states, accessible and inaccessible states.

UNIT-III

Phase space, division of phase space into cells, beta parameter and its identification with (kT)-1, probability, and entropy, Boltzmann’s entropy relation, Distinguishable and indistinguishable particles, Maxwell- Boltzmann statistics, application of M-B statistics to monoatomic gas, principle of equipartition of energy.

UNIT-IV

Bose-Einstein statistics, deduction of Planck’s radiation law, derivation of Wien’s displacement law and Stefan’s law, Fermi-Dirac statistics and its application to electron gas, comparison of three types of statistics.

Books Recommended:

1. Kittel, C., Knight, W. D., Ruderman, M. A., Helmholtz, C.A. and Moyer, R.J., Berkeley Physics Course, Vol.-I (Mechanics), 2nd Edition, Tata Mc Graw Hill Publishing Company Ltd., New Delhi.
2. Halliday, D., Resnick, R. and Walker, J., Fundamentals of Physics, 6thEdition, Wiley India Pvt. Ltd., New Delhi, 2004.
3. Gupta, S. K., Analytical Mechanics, Modern Publishers.
4. Dittman, R. H., Zemansky, M. W., Heat and Thermodynamics, 3rd Edition, McGraw-Hill.

Master of Science (Semester System) (12+5 System of Education with multiple Entries and Exits)

(Session-2024-25)

MASTER OF SCIENCE (FYIP) MATHEMATICS (SEMESTER–II)

COURSE TITLE: MECHANICS LAB-II

COURSE CODE: FMAM-2395

COURSE OUTCOMES:

After passing this course, students will be able to:

CO1: conduct a specific experiment from a given list, applying theoretical knowledge and practical skills to accurately complete the procedure and obtain reliable results.

CO2: articulate the theoretical background and principles underlying the chosen experiment.

CO3: demonstrate their understanding of the experiment through oral questioning and discussion.

CO4: well-organized and accurate practical file documenting all experiments conducted.

Master of Science (Semester System) (12+5 System of Education with multiple Entries and Exits)

(Session-2024-25)

MASTER OF SCIENCE (FYIP) MATHEMATICS (SEMESTER–II)

COURSE TITLE: MECHANICS LAB-II

COURSE CODE: FMAM-2398

Credits: 0-0-1 **Max Marks: 30**

Examination Time: 3 Hours **Pass Mark: 11**

Instructions to Practical Examiner

Question paper is to be set on the spot jointly by the external and internal examiners. Two copies of the same to be submitted for the record to COE office, Kanya Maha Vidyalaya, Jalandhar

General Guidelines for Practical Examination

The distribution of marks is as follows :

i) One experiment 10 Marks

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iv) Record (Practical file) 6 Marks

II. There will be one session of 2 hours duration. The paper will have one session. Paper will consist of 5 experiments, out of which an examinee will mark 4 experiments and one of these is to be allotted by the external examiner.

III. The number of candidates in a group for practical examination should not exceed 12.

IV. In a single group, no experiment should be allotted to more than three examinees.

List of Experiments

1. To determine the value of acceleration due to gravity at a place with Kater's pendulum.
2. To find the moment of inertia of a flywheel.
3. To find the moment of inertia of an irregular body about an axis through its centre of gravity with a torsion pendulum.
4. To find the value of surface tension of mercury by using Quink's method.
5. To determine the surface tension of water by noting its rise in a capillary tube.
6. To find the coefficient of viscosity of water by noting its flow through a capillary tube of uniform bore.

Text and Reference Books:

1. Practical Physics Vol.II, T.S. Bhatia, Gursharan Kaur, Iqbal Singh, Vishal Publications
2. Practical Physics, C.L. Arora, S. Chand & Co.