**University of Management and Technology**

**Course Outline**

Course code: PH 101 Course title: Mechanics

|  |  |
| --- | --- |
| Program | BSc Aircraft Maintenance Engineering Technology |
| Credit Hours | 03 |
| Duration | 15 weeks |
| Prerequisites | NA |
| Resource Person | Miss Hira Yaseen |
| Counseling Timing  (Room# ) | |  |  | | --- | --- | | Wednesday-Thursday: |  | | 10:00 AM to 4:30 PM |  | | 10:00 AM to 4:30 PM |  | |
| Contact | [hira.yaseen@umt.edu.pk](mailto:hira.yaseen@umt.edu.pk) |

**Faculty Signature ……………………. Date……………………………………………..**

**Chairman/Director signature…………………………………. Date………………………………………….**

**Dean’s signature…………………………… Date………………………………………….**

**Learning Objective:**

In general, the goal of physics is to develop descriptions of the natural world that correspond closely to actual observations. Given this definition, the story behind everything in the universe, from rocks falling to stars shining, is one of physics. In principle, the events of the natural world represent no more than the interactions of the elementary particles that the material universe is made of. In practice, however, it turns out to be more complicated than that.

As the system under study becomes more and more complex, it becomes less and less clear how the basic laws of physics account for the observations. Other branches of science, such as chemistry or biology, are needed. In principle, biology is based on the laws of chemistry, and chemistry is based on the laws of physics, but our ability to understand something as complex as life in terms of the laws of physics is well beyond our present knowledge. Physics is, however, the first rung on the ladder of our understanding of the physical universe.

In this course, we will study physics from the ground up, learning the basic principles of physical laws, their application to the behavior of objects, and the use of the scientific method in driving advances in this knowledge.

This courses contents mainly covers the following topics: limits of Mechanics. Coordinate systems. Motion under constant acceleration, Newton laws and their applications. Galilean invariance. Uniform circular motion. Frictional forces. Work and Energy. Potential Energy. Energy Conservation. Energy and our Environment. Angular momentum etc.

Students will learn the principles of mechanics to enable a better understanding of physical phenomena, such as the kinematics and dynamics of point masses and solid bodies. Students will acquire the capacity to quantitatively analyze these effects with the appropriate theoretical tools.

|  |  |  |  |
| --- | --- | --- | --- |
| **S No** | **CLO Statement** | **PLO** | **Learning Domain and level** |
|  | ***Explain*** the fundamental principles of mechanics | 1 | C1 |
|  | ***Outline***the Newton’s laws | 2 | C2 |
|  | ***Apply*** the Newton’s Laws, Applications of different forces such as Tension, Normal force, friction force etc on real life problems, work and energy dynamics | 3 | C3 |

1. **CLO – PLO MAPPING:**

|  |  |  |  |
| --- | --- | --- | --- |
| **CLOs** | **PLOs** | | |
| Mechanics and Physics Knowledge | Problem Analysis | Design / Development of Solutions |
| 1 | 2 | 3 |
| **C1** | **C2** | **C3** |

**Learning Methodology:**

* The course content is designed as a mixture of theory lectures and concept based tutorials.
* Worked examples involving hands on practice are also designed as part of the course to ensure active participation and consolidate learning.
* Participants will be evaluated based on assignments and quizzes from theory, worked examples and individual/group presentations.

**Recommended Text Books:**

“PHYSICS” (Fifth Edition, VOL. I) by R. Resnick, D. Halliday and K. S. Krane.

Publisher: JOHN WILEY & SONS, INC.

**Reference Books:**

Fundamentals of Physics, 8th Edition by Halliday, Resnick, and Walker.

**Grade Evaluation Criteria**

Following is the criteria for the distribution of marks to evaluate final grade in a semester.

**Theory:**

|  |  |
| --- | --- |
| **Marks Evaluation** | **Marks in percentage** |
| Quizzes (x6) | 15% |
| Assignments (x2) | 5% |
| Term Project\* | 10% |
| Mid Term Examination | 30% |
| End Term Examination | 40% |
| **Total** | 100 % |

**Calendar of Course contents to be covered during semester**

**Course code: PH 101 Course title: Mechanics**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Week** | **Course Contents** | **Reference Chapter(s)** | **Quiz** | **Assignments** | | **CLOs** |
| 1-2 | |  | | --- | | **Physical quantities, standard and units,**  **The international system of units,**  **The standard of time**  **The standard of length, the standard of mass** | | **Precision and significant figures,**  **Dimension analysis**  **Kinematics with vector, Properties of vector**  **VECTOR ANALYSIS Vector in 3 dimensions:**  **Review of vector and operation** | | 1 | 1 |  | | 1 |
| 3-4 | |  | | --- | | **Position, velocity and acceleration physics**  **Freely falling bodies** | | **Newton’s first law**  **Force, Mass**  **Newton’s second law**  **Newtons third law**  **Microscopic Basis of friction,**  **conical pendulum, the rotor,**  **the Banked curve, equation of motion**  **(constant forces)**  **Dynamic of Uniform:**  **The rotors, circular motion the banked curve.** | | 2 |
| 5 | |  | | --- | | **Equations of Motion:**  **Deriving kinematics equations x (y). V(t) using integrations. Constant and Non Constant forces and Special examples Time Dependent Force:**  **Obtaining x (t), v(t) for this case using integration method. Effect of Drag Forces on Motion: Applying Newton’s Law to obtain V (t) for the case of motion with the time dependent (Integration Approach) drag (Viscous) forces** | | **Weight and mass**  **Applications of Newton’s law** | | 3 | 2 |  | | 2 |
| 6-7 | |  | | --- | | **Newton’s second law**  **Newtons third law** | | **Weight and mass**  **Applications of Newton’s law** | | 3 |
| 7 | **Motion in three dimensions with constant acceleration, Newton’s laws in three-dimensional vector form**  **Projectile motion**  **Uniform circular motion, Relative motion** | 4 | 1 |  | 3 | |
| 8 | **Mid Term Examination** | | | | | |
| 9 | |  | | --- | | **Force laws, Tension and normal forces**  **Frictional forces** | | **The dynamics of uniform circular motion**  **Collisions, Linear momentum, Impulse and momentum** | | 4 | 1 |  | | 3 |
| 10 | |  | | --- | | **Force laws, Tension and normal forces**  **Frictional forces** | | **The dynamics of uniform circular motion**  **Collisions, Linear momentum, Impulse and momentum** | | 5 | 1 |  | | 3 |
| **11** | |  | | --- | | **Conservation of momentum** | | **Two body collision** | | 6 |
| **12** | |  | | --- | | **Center of mass of solid objects** | | **Torque, Rotational inertia and Newtons’s second law,**  **Torque due to gravity** | | 7, 9 | 1 | 1 | | 3  3 |
| **13** | |  | | --- | | **Angular momentum of a particle, Angular momentum,**  **and angular velocity** | | **Conservation of angular momentum** | | 10 |
| **14** | |  | | --- | | **Work and energy, work done by constant force and angular velocity** | | **Power, work done by a varying force** | | 11 |  | 1 | | 3 |
| **15** | **Revision week** |  |  |  | |  |

**Mapping of CLOs to Direct Assessments**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Direct Assessments | | | | | | | | | | | |
| CLOs | Quiz#1 | Quiz#2 | Quiz#3 | Quiz#4 | Quiz#5 | Quiz#6 | Assignment  #1 | Assignment  #2 | Mid  Term  Exam | Final  Project | Final  Term  Exam |
| 1 | ✔ | ✔ |  |  |  |  |  |  | ✔ |  |  |
| 2 |  |  | ✔ | ✔ | ✔ |  |  |  | ✔ |  |  |
| 3 |  |  |  |  |  | ✔ | ✔ | ✔ |  | ✔ | ✔ |

Class Policy

**STUDENTS ARE REQUIRED TO READ AND UNDERSTAND ALL ITEMS OUTLINED IN THE PARTICIPANT HANDBOOK**

**CLASS ATTENDANCE:** Students need to be in class at the assigned time. After 10 minutes past the assigned time, the students will be marked absent.

**TURN OFF MOBILE PHONE**! It is unprofessional to be texting or otherwise.

**READ EMAILS!** Participants should regularly check their university emails accounts regularly and respond accordingly. Students would be responsible if they miss a deadline because of not reading the emails.

**CLASS ATTENDANCE POLICY:** A minimum of 80% attendance is required for a participant to be eligible to sit in the final examination. Being sick and going to weddings is absence and will not be counted as present. Participants with less than 80% of attendance in a course will not be allowed to take end term exams. International students who will be leaving for visa during semester should not use any days off except for visa trip to avoid reaching short attendance.

**MOODLE:** UMT –LMS (Moodle) is an Open Source Course Management System (CMS), also known as a learning Management System (LMS). Participants should regularly visit the course website on MOODLE Course Management system, and fully benefit from its capabilities. In case of any problem while using MOODLE, visit <http://oit.umt.edu.pk/moodle>. For queries email [moodle@umt.edu.pk](mailto:moodle@umt.edu.pk)

**HARASSMENT POLICY:** Sexual or any other harassment is prohibited and is constituted as punishable offence. Sexual or any other harassment of any participant will not be tolerated. All actions categorized as sexual or any other harassment when done physically or verbally would also be considered as sexual harassment when done using electronic media such as computers, mobiles, internet, emails etc.

**USE OF UNFAIR MEANS/ HONESTY POLICY:** Any participant found using unfair means or assisting another participant during a class test/quiz, assignments or examination would be liable to disciplinary action.

**PLAGIARISM POLICY:** All students are required to attach a “Turnitin” report on every assignment, big or small. Any student who attempts to bypass “TurnItin” will receive “F” grade which will count towards the CGPA. The participants submit the plagiarism report to the resource person with every assignment, report, project, thesis etc. If student attempts to cheat Turnitin, a second “F” will be awarded that will count towards the CGPA. There are special rules on plagiarism for final reports etc. all outlined in your handbook.

**COURSE WITHDRAWAL POLICY:** Students may withdraw from a course till the end of the 12th week of the semester. Consequently, grade ‘W’ will be awarded to the student which shall have no impact on the calculation of the GPA of the student. A Student withdrawing after the 12th week shall be automatically awarded “F” grade which shall count in the GPA.

**COMMUNICATION OF RESULTS:** The results of quizzes and assignments are communicated to the participants during the semester and answer books are returned. It is the responsibility of the course instructor to keep the participants informed about his/her progress during the semester. The course instructor will inform a participant at least one week before the final examination related to his or her performance in the course.