# Course Specifications
# Mechanics B122

**University: Benha University** **Faculty: Benha Faculty of engineering**

**Course specifications**

**Programme(s) on which the course is given** **All**

**Major or minor element of programmes**

**Department offering the programme** **All**

**Department offering the course** **Department of Basic Sciences**

**Academic year / Level** **First Year – The Second Semester**

**Date of specification approval**

## A- Basic Information

**Title: Mechanics** **Code: B122**

**Credit Hours:** **Lecture: 2 hours**

**Tutorial: 2 hours** **Practical: ---** **Total: 4 hours**

## B- Professional Information

**1 - Overall aims of course**

**By the end of this course the student will be able to:**

- **Use constant acceleration formulas that describe the position, displacement, and velocity of particles in rectilinear motion**
- **Understand the kinematics of particles in rectilinear motion**
- **Determine the motion of particles in rectilinear motion for different types of variable acceleration**
- **Understand the kinematics of the curvilinear motion of particles using different types of coordinates**
- **Evaluate the kinematical properties of the motion of projectiles**
- **Analyze the motion of a particle relative to a frame in translation**
- **Write and solve the equations of motion of a particle in different coordinate systems using Newton's second law**

- **Understand the different systems of units used in dynamic analysis of particles**
- **Study the motion of particles using the principle of work and energy**
- **Understand the concept of conservative forces and the principle of the conservation of energy**
- **Study the motion of particles using the principle of impulse and momentum**
- **Understand the impact between two particles and its types**
- **Understand the simple harmonic motion**

**a. Knowledge and understanding:**

**a.1 Explain the general principles of rectilinear motion of particles**

**a.2 Explain the general principles of curvilinear motion of particles**

**a.3 Understand how to use Newton's second law to analyze the motion of particles using different types of coordinates**

**a.4 Understand how to use the energy and momentum methods to analyze the motion of particles**

**a.5 Understand the simple harmonic motion of a particle**

**b. Intellectual skills**

**Gain skills in solving different types of problems concerning the motion of particles in both branches of dynamics (kinematics and kinetics)**

**c- Professional and practical skills**

**c.1 Practice in dealing with problems of kinematics of particles in rectilinear motion**

**c.2 Practice in dealing with problems of kinematics of particles in curvilinear motion**

**c.3 Practice in using Newton's second law and the energy and momentum methods for solving problems of kinetics of particles**

**d- General and transferable skills**

**d.1 Practice in dealing with problems of kinematics of particles in rectilinear motion**

**d.2 Practice in dealing with problems of kinematics of particles in rectilinear motion**

**d.3 Practice in using Newton's second law and the energy and momentum methods for solving problems of kinetics of particles**

**3- Contents**

| Topic | No. of Hours | Lecture | Tutorial/ Practical |
|---|---|---|---|
| **Kinematics of particles: Rectilinear motion of particles -- Curvilinear motion of particles (Rectangular components -- Tangential and normal components -- Radial and transverse components) – Motion of projectiles -- Motion relative to a frame in translation** | **20** | **10** | **10** |
| **Kinetics of Particles: Newton's second law – Linear momentum of a particle – Systems of units – angular momentum of a particle – Motion under a central force -- Newton's law of gravitation** | **12** | **6** | **6** |
| **Kinetics of Particles: Principle of work and energy -- Power and efficiency – Conservation of energy – Principle of impulse and momentum – Impulsive motion -- Impact** | **16** | **8** | **8** |
| **Simple harmonic motion** | **4** | **2** | **2** |
| **Beams: Distributed loads, reactions and internal actions** | **8** | **4** | **4** |

**4– Teaching and learning methods**

**4.1- Lectures**

**4.2- Class tutorials**

**5- Student assessment methods**

**5.1 Homework**

**5.2 Quizzes and mid-term examination to assess the knowledge, understanding, learning**

**5.3 Final Examination**

**Assessment schedule**

| | |
|---|---|
| **Assessment 1** | **Quizzes ( Three to four Quizzes)** |
| **Assessment 2** | **Homework** |
| **Assessment 3** | **Mid – Term Examination during the 8th week** |
| **Final Examination** | |

**Weighting of assessments**

| | |
|---|---|
| **Mid-term examination** | **30 %** |
| **Final-term examination** | **60 %** |
| **Attendance and assignments** | **10 %** |
| **Total** | **100 %** |

**6- List of references**

**6.1- Course notes**

**Lectures' notes**

**6.2- Essential books (text books)**

i. **Ferdinand P. Beer & E. Russell Johnston, Jr. , "Vector Mechanics for Engineers -- Dynamics", McGraw Hill**
ii. **R. C. Hibbler, " Engineering Mechanics – Dynamics" Macmillan**
iii. **J. L. Meriam & L. G. Kraige, "Engineering Mechanics – Dynamics", John Wiley and Sons**
iv. **Irving Shames, "Engineering Mechanics -- Dynamics", Printice Hall**

**7- Facilities required for teaching and learning**

**Data show and projectors**

**Course coordinator: Dr. Mohamed Diaa El-Din Khidr**

**Head of Department: Prof. Dr. Hassan Nasr Ahmad Ismail**

**Date: / /**