هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA
T4
2020

Course Specifications

Course Title:	**General Biology**
Course Code:	**BIO101**
Program:	**Bachelor of Science in Biology**
Department:	**Department of Biology**
College:	**Faculty of Science**
Institution:	**University of Tabuk**

Table of Contents

A. Course Identification

1. Credit hours:	**3 hours (3 Theoretical) hours**
2. Course type	
a. University √ College ☐ Department ☐ Others ☐	
b. Required √ Elective ☐	
3. Level/year at which this course is offered:	**Level 2/ Second semester / First year**
4. Pre-requisites for this course (if any)**: None**	
5. Co-requisites for this course (if any)**: None**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	3	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	39
2	Laboratory/Studio	
3	Tutorial	
4	Others (specify)	
	Total	39

B. Course Objectives and Learning Outcomes

1. Course Description

- This is an introductory course that includes the study of the chemical composition of organic molecules in the living organisms; structure and the cell cycle as well as the cell proliferation; meiosis and sexual reproduction, then the circulatory system and the cardiovascular system. The digestive system and nutrition, in addition the respiratory and nervous systems. Also, studying an overview of the flowering plants and photosynthesis (Photochemical reactions and Calvin cycle).

2. Course Main Objective

- To provide scientific fundamentals knowledge of biological science to expand the perceptions of students on Biology.
- To develop necessary skills for the study of other scientific courses in subsequent program levels.
- To develop capabilities in students for scientific way of thinking and illustrate the positive impact of the general biology science in daily life.
- To stimulate interest in Biology and Biology-related careers.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	To identify nature and chemistry of organic molecules.	**K1**
1.2	To recognize the main differences between Eukaryotic and prokaryotic cells.	**K1**
1.3	To describe human body systems (structure and function).	**K1**
1.4	To outline the plant tissues structure and function.	**K1**
2	**Skills:**	
2.1	To compare between cell types and reproduction types.	**S1**
3	**Values:**	
3.1	To work independently as a member or as a team.	**V1**

C. Course Content

No	List of Topics	Contact Hours
1	Introduction to biology.	3
2	Chemistry of organic molecules.	3
3	Eukaryotic and prokaryotic cell structure and function.	3
4	Eukaryotic and prokaryotic cell structure and function.	3
5	Cell cycle and Mitosis cell division.	3
	First Midterm Exam	
6	Meiosis and sexual reproduction.	3
7	Circulation and cardiovascular system	3
8	Digestive system and nutrition.	3
9	Respiratory system.	3
10	Nervous system.	3
11	Flowering plants (structure and organization).	3
	Second Midterm Exam	
12	Photosynthesis (light reactions).	3
13	Photosynthesis (Calvin cycle reactions)	3
	Final exam	
	Total	**39**

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Identify nature and chemistry of organic molecules.	- Lectures.	- Quizzes. - Homework. - Periodic exam. - Final exam.
1.2	Recognize the main differences between Eukaryotic and prokaryotic cells.	- Activities and homework.	- Quizzes. - Homework. - Periodic exam.

			- Final exam.
1.3	To describe human body systems (structure and function).	- Lectures. - Use of the Internet.	- Quizzes. - Homework. - Periodic exam. - Final exam.
1.4	To outline the plant tissues structure and function.	- Lectures - Activities and homework.	- Quizzes. - Homework. - Periodic exam. - Final exam.
2.0	**Skills**		
2.1	To compare between cell types and reproduction types.	- Lectures - Activities and homework.	- Quizzes. - Homework. - Periodic exam. - Final exam.
3.0	**Values**		
3.1	To work independently as a member or as a team.	- Work in groups.	- Interactive discussion and participation.

2. Assessment Tasks for Students

#	*Assessment task	Week Due	Percentage of Total Assessment Score
1	Short quizzes	3	10%
2	First Midterm Exam	6	20%
3	Second Midterm Exam	12	20%
4	Final exam	15	50%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:

- Office hours 6 hrs./ week at least.
- Academic Guidance: about 30 students allotted to each faculty member.
- Direct supervision of staff for lab works.
- Electronic communication through black board and e-mail.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	- Sylvia Mader, (2013) Biology (11th Ed.) ISBN13: 978-0073525501, ISBN10: 0073525502, McGraw-Hill Publishing Company. 2. Biology Compiled by University of Tabuk for first year students.
Essential References Materials	NA
Electronic Materials	NA
Other Learning Materials	NA

2. Facilities Required

Item	Resources
Accommodation Classrooms, laboratories, demonstration) (.rooms/labs, etc	- A sufficient number of classrooms, well equipped -Practical laboratories are available to accommodate students. -Virtual session provided by the blackboard (which allow discussions and sharing PowerPoint and video)
Technology Resources AV, data show, Smart Board, software,) (.etc	-Data show. -Wireless connection in the building for students and faculties.
Other Resources Specify, e.g. if specific laboratory) equipment is required, list requirements or (attach a list	- NA

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
- Effectiveness of teaching and assessment.	- Students.	Indirect - Questionnaires.
- The extent of achieving the course learning outcomes.	- Program committee. - Staff members. - Students.	Direct - Questionnaires. - Reports. - Meetings
- Quality of learning resources.	- Program leaders. - Peer Reviewer.	Direct & Indirect - Questionnaires. - Reports. - Meetings

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Biology Department Council
Reference No.	
Date	

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA
T4
2020

Course Specifications

Course Title:	General Chemistry
Course Code:	CHEM 101
Program:	General Education
Department:	Department of Chemistry
College:	Faculty of Science
Institution:	University of Tabuk

Table of Contents

A. Course Identification

1. Credit hours: 3	
2. Course type	
a. University √ College ☐ Department ☐ Others ☐	
b. Required √ Elective ☐	
3. Level/year at which this course is offered: 1st year / 1st, 2nd and summer Semester	
4. Pre-requisites for this course (if any)**:** NA	
5. Co-requisites for this course (if any)**:** **NA**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	39	100 %
2	**Blended**	0	0 %
3	**E-learning**	0	0%
4	**Distance learning**	0	0 %
5	**Other**	0	0 %

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	39
2	**Laboratory/Studio**	0
3	**Tutorial**	0
4	**Others** (specify)	0
	Total	39

B. Course Objectives and Learning Outcomes

1. Course Description

CHEM 101 is an introductory chemistry course designed to prepare students for college level, so the course introduces the fundamentals of chemistry including classification of matter, physical and chemical changes, units of measurements, atomic structure, quantum numbers, electronic configuration, periodic table and molecules and ions, chemical formulas, naming simple compounds, chemical equations and basic chemical calculations, chemical equilibrium, laws of gases and introduction to organic chemistry.

2. Course Main Objective

Provide the basic principles of chemistry to expand the perceptions of students and provide them with the information necessary for the study of chemical science courses in other subsequent phases and providing the students with the skills and abilities necessary and essential to the methodology and scientific thinking and illustrate the positive impact of chemistry in everyday life.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Define the basic terms in chemistry including types of matter, atom, molecule, ions, chemical formulas, mole concept, chemical equilibrium, quantum numbers and classes of organic compounds.	K1
1.2	Explain the basic principles of chemistry including Si units of measurements, nature of electromagnetic radiation, atomic structure, laws of gases, chemical equilibrium, electronic configuration construction of periodic table and isomerism in organic compounds	K2
2	**Skills :**	
2.1	Differentiate between classes of matter, types of mixtures, physical and chemical changes, extensive and intensive properties, and classes of organic compounds	S1
2.2	Predict the chemical and physical properties of the elements according to their positions in the periodic table; the position of chemical equilibrium upon applying external stress; and the name of simple inorganic and inorganic compounds.	S2
2.3	Apply the laws of gases to pure gases and mixture of gases; the tools needed for Balancing chemical equations; and the basic chemical calculations related to the chemical reactions.	S4
3	**Values:**	
3.1	Ability to work independently.	V2
3.2	Adhere to the ethics associated with education and study of chemistry.	V1

C. Course Content

No	List of Topics		Contact Hours
1	Classification of matters, physical and chemical changes, units of measurements	• Classification of matter • Three states of matter • Physical and chemical properties of matter • Units of Measurements	3
2	Atomic structure, atom, molecule, ions and chemical formula	• Atomic theory	1.5
		• Structure of an atom • Atomic number, mass number and isotopes	1.5
		• The Periodic Table • Molecules and ions • Chemical Formulas	1.5
3	Nomenclature of simple inorganic compounds	• Naming compounds	1.5
4	Chemical reactions and chemical calculations	• Atomic mass • Avogadro's number and molar mass • Molecular mass	1.5
		• Percent composition of compounds • Experimental determination of empirical formula	1.5
		• Chemical reactions and chemical equations • Amounts of reactants and products	1.5
		• Limiting Reactants	1.5

		• Reaction Yield	
5	Laws of gases	• Substances that exist as gases • Pressure of a gas • The gas Laws	1.5
		• Ideal gas equation • Dalton's law of partial pressures	1.5
6	Nature of electromagnetic Radiation and atomic structure	• From classical physics to quantum mechanics	1.5
		• The photoelectric effect • Bohr theory of the hydrogen atom	1.5
		• Dual nature of electron	1.5
7	Quantum numbers and electronic configuration	• Quantum numbers • Atomic Orbitals	1.5
		• Electronic configuration • Build-up principle	1.5
8	Periodic table and periodicity of the properties of the elements	• Development of the periodic table • Periodic Classification of elements	1.5
		• Periodic variation of physical properties • Ionization energy • Electron affinity	1.5
9	Chemical equilibrium and factors affecting it	• The concept of equilibrium and equilibrium constant • Writing equilibrium constant expression • Relation between chemical kinetics and chemical equilibrium	3
		• What Does the Equilibrium Constant Tell Us? • Factors that affect chemical equilibrium	3
10	Introduction to organic chemistry	• Classes of organic compounds • Aliphatic hydrocarbons	3
		• Aromatic Hydrocarbons • Chemistry of Functional groups	1.5
Total			39

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Define the basic terms in chemistry including types of matter, atom, molecule, ions, chemical formulas, mole concept, chemical equilibrium, quantum numbers and classes of organic compounds.	Traditional Lectures Open discussion Brain Storming	Exams Quizzes Homework assignment
1.2	Explain the basic principles of chemistry including Si units of measurements, nature of electromagnetic radiation, atomic structure, laws of gases, chemical equilibrium, electronic configuration construction of	Traditional Lectures Open discussion Brain Storming	Exams Quizzes Homework assignment

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	periodic table and isomerism in organic compounds		
2.0	**Skills**		
2.1	Differentiate between classes of matter, types of mixtures, physical and chemical changes, extensive and intensive properties, and classes of organic compounds	Traditional Lectures Open discussion Brain Storming	Exams Quizzes Homework
2.2	Predict the chemical and physical properties of the elements according to their positions in the periodic table; the position of chemical equilibrium upon applying external stress; and the name of simple inorganic and inorganic compounds.	Traditional Lectures Open discussion Exercises in class	Exams Quizzes Homework
2.3	Apply the laws of gases to pure gases and mixture of gases; the tools needed for Balancing chemical equations; and the basic chemical calculations related to the chemical reactions.	Traditional Lectures Open discussion Case-based learning	Exams Quizzes Homework
3.0	**Values**		
3.1	Ability to work independently.	Open discussion in class Preparation of the Subjects of the next lecture by the students Homeworks	Homework assignment Homework presentation
3.2	Adhere to the ethics associated with education and study of chemistry.	Open discussion in class Essay writing Homeworks	Homework presentation Essay discussion and presentation

2. Assessment Tasks for Students

#	Assessment task*		Week Due	Percentage of Total Assessment Score
1	Coursework (homework's and problem solving)		During semester	5%
2	Written Exams	First midterm	Week 7	20%
		Second midterm	Week 12	20%
		Quizzes' (Short Exams)	During semester	10%
		Final theoretical Exam	Week 17	40%
3	Activities	Class activities	During semester	5%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:

- Direct supervision by course tutor over class activities.
- Office hours 8hr/ week. to address students' questions.

- Academic Guidance: The student is supervised by an academic advisor for advice and guidance.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Chemistry, Raymond Chang and Kenneth A. Goldsby, McGraw-Hill Education, 12th edition, 2016.
Essential References Materials	● Chemistry, by Steven S. Zumdahl and Susan A. Zumdahl, 7th ed., Houghton Mifflin Company, 2007. ● Chemistry Core Concepts" 2nd Ed. by Blackman, Bridgeman, Lawrie, Southam, Thompson and Williamson, 2018, Wiley.
Electronic Materials	Saudi digital Library http://www.encyclopedia.com http://www.wikipedia.com
Other Learning Materials	NA

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Traditional classroom; Classrooms with 25 seats
Technology Resources (AV, data show, Smart Board, software, etc.)	Multimedia projector, smart board
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Molecular Models

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Extent of achievement of course learning outcomes	Faculty	Direct
Effectiveness of teaching and assessment.	Students and faculty	Indirect
Quality of learning resources	Peer Reviewer, students	Indirect

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	

Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

Course Specifications
(CS)

CHEM 203

General Chemistry Lab
Second Semester 1443-1444H

Course Specifications

Institution: University of Tabuk	Date of Report: 02/06/2022
College/Department: **Faculty of Science / Department of Chemistry**	

A. Course Identification and General Information

1. Course title and code: **General chemistry lab. CHEM 203**
2. Credit hours : **1 Hour**
3. Program(s) in which the course is offered: Engineering Students
4. Name of faculty member responsible for the course: **Fahad Jubran Mujammami**
5. Level/year at which this course is offered: 2^{th} level
6. Pre-requisites for this course (if any): **N/A**
7. Co-requisites for this course (if any): **N/A**
8. Location if not on main campus: **Chemistry Department Main Campus (Male students**

9. Mode of Instruction (mark all that apply)

a. Traditional classroom	√	What percentage?	10%
b. Blended (traditional and online)		What percentage?	
c. e-learning		What percentage?	
d. Correspondence		What percentage?	
f. Other (practical)	√	What percentage?	90%

Comments:

B. Objectives

1. What is the main purpose for this course? Upon the completion of this course the student will be able to: • **Emphasizes the theories and analysis of inorganic salts**. • **Know handling chemical and glasswares in the lab**
2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field) • **Help students to analyze the inorganic salts.** • **New and updated text books.** • **Related web sites.** • **Provide time for tutorials.**

C. Course Description (Note: General description in the form to be used for the Bulletin or handbook should be attached)

1. **Topics to be covered**

List of Topics	No of Weeks	Contact hours
• Safety precautions and handling of glass ware in lab, Introduction to qualitative analytical chemistry	2	4
The first acidic group	2	4
The second and third acidic group	2	4
Scheme for investigation the acidic radicals	1	2
• The first and second basic group	2	4
The third and fourth basic groups	2	4
• The fifth and sixth basic groups	2	4
• Scheme for investigation of basic radicals	2	4

2. Course components (total contact hours and credits per semester): 2 Hours

	Lecture	Tutorial	Laboratory	Practical	Other:	Total
Contact Hours	-	**NA**	**30**	**NA**	**NA**	**30**
Credit	-	-	**15**	-	-	**15**

3. Additional private study/learning hours expected for students per week.	4 hrs

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy

	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge**		
1.1	• **Analysis of inorganic salts**	• Practical labs. • Discussion	• In class – quizzes and homework.
1.2	**Define solubility product**	• Practical labs. • Discussion	Mid-term and final exams, quizzes
1.3	**Know common ion effect**	• Practical labs. • Discussion • Assignments	Mid-term and final exams, quizzes
1.4	**Define of ionic strength**	• Practical labs. • Discussion	Mid-term and final exams, quizzes
1.5	**Know how to determine solubility of ions**	• Practical labs.	quizzes
2.0	**Cognitive Skills**		
2.1	**Understanding co-precipitation**	• **Practical labs.**	• **In class tutorials**

			time to time. • **In class quizzes.** • **Asking questions during lecture.** • **Mid-term and final exams.**
2.2	**Differentiate between basic and acidic radicals**	• **Practical labs.**	• **In class tutorials time to time.** • **In class quizzes.** • **Asking questions during lecture.** • **Mid-term and final exams.**
3.0	**Interpersonal Skills & Responsibility**		
3.1	• Work effectively both individually and in teams in both classroom..	Working individually or as groups inside the class.	• Self performance in class.
3.2	• Demonstrate the ethical and professional standards articulated by professional organizations (e.g. the American Chemical Society).		• Written presentation of assignments.
3.3	• Understand the interrelationships among chemistry, technology, and global society, and of the societal implications of new developments in science.		• Direct contact during office hours.
4.0	**Communication, Information Technology, Numerical**		
4.1	• **Able to express himself.**	• **Oral presentations**	• observation
4.2	• Using computational tool	• **assignments**	• homework assignments
5.0	**Psychomotor**		
5.1	**NA**	**NA**	**NA**
5.2	**NA**	**NA**	**NA**

5. Schedule of Assessment Tasks for Students During the Semester			
	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	**Quiz 1**	**Week 3**	**5%**
2	**First Mid-term exam.**	**Week 7**	**25%**
3	**Quiz 2**	**Week 9**	**5%**
5	**2nd mid term exam**	**Week 13**	**25%**
	Final exam	**Week 17**	**40%**

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)

- **Academic advices needed by the students.**
- **Office hours (10 per week for all students)**

E. Learning Resources

1. List Required Textbooks

Vogel's textbook of quantitative chemical analysis. - 5th ed.

2. List Essential References Materials (Journals, Reports, etc.)

3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)

Science direct

Springer link

4. List Electronic Materials (eg. Web Sites, Social Media, Blackboard, etc.)

http:// Ocw.mit.edu/course/chemistry/

http://www.iupac.org/
Relevant Websites.Wikipedia

5. Other learning material such as computer-based programs/CD, professional standards or regulations and

software. • **PowerPoint presentation.** • **Interactive and multimedia soft-books.**

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) • **Lab capacity of 25 students.** **Smart boards.**

2. Computing resources (AV, data show, Smart Board, software, etc.) **LCD projector should be provided in each classroom and should be in working condition.**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) **Scientific calculators** **Data show** **Computer in classrooms** **Scientific calculators** **Data show** **Computer in classrooms**

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching • **Course evaluation by students.**
2 Other Strategies for Evaluation of Teaching by the Program/Department Instructor • **Peer consultation on teaching.** • **Departmental council meetings.** • **Discussion with physical group.**
3 Processes for Improvement of Teaching • **Conducting workshops presented by experts on the teaching methodologies.** • **Departmental versions on its methods at teaching.**

4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution) • **Assigning group of members teaching the same course to grade same questions for various students.** • **Conducting standard exams.** • **Faculty member from other universities to review and evaluate the accuracy of grading policy.**

5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. • **The chair man of the department and faculty council take the responsibility.** • **The course material should be reviewed by departmental, faculty and higher council.**

Faculty or Teaching Staff:

Signature: _________________________________ Date Report Completed: _____________________

Received by: ___ ____________________________ Dean/Department Head

Signature: _________________________________ Date: ________________

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

Course Specifications

Course Title:	**Engineering Drawing and Graphics**
Course Code:	**ENG201**
Program:	**Bachelor of Science in Mechanical Engineering**
Department:	**Mechanical Engineering**
College:	**Faculty of Engineering**
Institution:	**University of Tabuk**

Table of Contents

A. Course Identification

1. Credit hours: 3								
2. Course type								
a.	University	☐	College	√	Department	☐	Others	☐
b.	Required	√	Elective	☐				
3. Level/year at which this course is offered: 3/2								
4. Pre-requisites for this course (if any)**:** None								
5. Co-requisites for this course (if any)**:** None								

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	75	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	15
2	**Laboratory/Studio**	60
3	**Tutorial**	
4	**Others** (specify)	
	Total	75

B. Course Objectives and Learning Outcomes

1. Course Description

The course introduces:

- Engineering drawing techniques and skills.
- Orthographic projection of engineering bodies: points, lines, surfaces, and bodies; Derivation of views from isometric drawings and vice versa.
- Derivation of views and sections from given views; Intersection of bodies and surfaces.
- Computer Aided Drawing (CAD);
- Fundamentals of engineering graphics in 2D and 3D drawings.

2. Course Main Objective

The main purpose for this course is to enhance:

- Comprehend the principles of orthographic projections.
- Imagine and draw different shapes and connections.

- Skill of using drawing tools.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Recall the main Concepts of Geometrical Constructions	K1
1.2	Recall the main Concepts of Isometric Drawings	K1
1.3		
1...		
2	**Skills :**	
2.1	Sketch Orthographic Projections	S1
2.2	Sketch Missed View	S1
2.3	Sketch Sectional Views	S1
2...		
3	**Values:**	
3.1		
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Geometric constructions	15
2	Isometric Drawings	15
3	Multi-view drawings, Orthographic projection, Missed view derivation	30
4	Sectional Views	15
5		
...		
Total		75

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Recall the main Concepts of Geometrical Constructions	Lectures	• Classwork
1.2	Recall the main Concepts of Isometric Drawings		
2.0	**Skills**		
2.1	Sketch Orthographic Projections	Lectures, Problem based learning	• Class work. • 1st Midterm Exams
2.2	Sketch Missed View		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.3	Sketch Sectional Views		• 2nd Midterm Exams Final Exam:
3.0	**Values**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Midterm Exam 1	5	15%
2	Midterm Exam 2	5	15%
3	Class work	1 to 15	30%
4	Final Exam	16	30%
4			
5			
6			
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

Each faculty member of the teaching team has 8 hours per week for consultations and academic advice.

The Mechanical Engineering Program (MEP) prioritize the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	• Textbook of Engineering Drawing, 2nd. Edition, K. Venkata Reddy, B.S. Publications, 2008. • Geometric and Engineering Drawing, 3rd. Edition K . MORLING, Elsevier, 2010.

Essential References Materials	• James D. Bethune "Engineering Graphics with AUTOCAD 2008", Prentice Hall, 2008. • Thomas, E.E. Charles, J.V. and Robert J.F, Engineering Drawing and Graphic Technology, 14th. Ed, McGraw-Hill Science. • James H. Earle, Graphics for Engineers, 6th. Edition, Pearson Education, Inc.
Electronic Materials	YouTube learning videos. **1. Educational YouTube Channels:** ● LearnEngineering ● https://www.youtube.com/watch?v=lzGwrOHh99U
Other Learning Materials	AutoCAD software documentation. **Lecture Notes and Tutorials:** • MIT OpenCourseWare (https://ocw.mit.edu/index.htm) • LectureNotes (https://lecturenotes.in/) **Technical Blogs and Articles:** • Mechanical Engineering Blog (https://www.engineeringchoice.com/mechanical-engineering-blog/) 1. **Technical Magazines:** • Mechanical Engineering Magazine (https://www.memagazine.org/) • Machine Design Magazine (https://www.machinedesign.com/) 2. **Interactive Learning Platforms:** • Chegg Study (https://www.chegg.com/study) • Quizlet (thttps://quizlet.com/) •

2. Facilities Required

Item	Resources
Accommodation	Classrooms equipped with data show. White Board.
Technology Resources	Data Show.
Other Resources	Computer Lab

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Effectiveness of teaching	Students	Online survey

Evaluation Areas/Issues	Evaluators	Evaluation Methods

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAA T4 2020

Course Specifications

Course Title:	Production engineering and workshops
Course Code:	ENG202
Program:	Bachelor of Science in Mechanical Engineering
Department:	Mechanical Engineering
College:	Faculty of engineering
Institution:	Tabuk university

Table of Contents

A. Course Identification

1. Credit hours:3							
2. Course type							
a.	University	☐	College	☒ x	Department	☐	Others ☐
b.	Required	☒ x	Elective	☐			
3. Level/year at which this course is offered: 4/2							
4. Pre-requisites for this course (if any): ENG201							
5. Co-requisites for this course (if any)**:** None							

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	15	25%
2	**Blended**	0	0
3	**E-learning**	0	0
4	**Distance learning**	0	0
5	**workshop**	30	75%

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	15
2	**Laboratory/Studio**	0
3	**Tutorial**	0
4	**Others** (specify) workshops	30
	Total	45

B. Course Objectives and Learning Outcomes

1. Course Description

Function and planning of workshops; Properties of engineering materials and their applications; Workshop metrology; Basic bench work operations; Machining operations; Tools; Equipment and machinery used in basic workshop processes: turning, milling, grinding, forging, sheet metal-work; Measurements: standardization, international measuring systems; Cost analysis and estimation of maintenance; Welding processes; Casting processes; Industrial safety; Workshops.

2. Course Main Objective
Preparing the student for the work environment, strengthening the work side in a team, and developing practical workshop and scientific skill

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Demonstrate knowledge of function and planning of workshops.	K1
1.2	Explain using basic workshop processes: turning, milling, grinding, forging, sheet metal-work	K1
2	**Skills :**	
2.1	Apply Properties of engineering materials and their applications	S1
2.2	Analyze Cost and estimation of maintenance	S1
2.3	Conduct workshop metrology; basic bench work operations; machining operations	S3
3	**Values:**	
3.1		
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Introduction; Industrial safety; Workshops.	4
2	Function and planning of workshops	4
3	Properties of engineering materials and their applications	5
4	Workshop metrology; Basic bench work operations; Machining operations; Tools;	8
5	Equipment and machinery used in basic workshop processes: turning, milling, grinding	8
6	forging, sheet metal-wor	8
7	Welding processes; Casting processes	4
8	Cost analysis and estimation of maintenance	4
Total		45

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Demonstrate knowledge of function and planning of workshops.	Lectures	. Quizzes
1.2	Explain using basic workshop processes: turning, milling, grinding, forging, sheet metal-work	Lectures	Quizzes

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.0	**Skills**		
2.1	Apply Properties of engineering materials and their applications	Lectures	. Quizzes
2.2	Analyze Cost and estimation of maintenance	Lectures	Quizzes
2.3	Conduct workshop metrology; basic	Lectures	quizzes
2.4	bench work operations; machining operations	Practical	Technical report
3.0	**Values**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quizzes	Weekly	40 %
2	Class work	2,4,6,8	40 %
3	Technical report	Last week	20%
4			
5			
6			
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

The Instructor has 4 hours per week for consultations and academic advice.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	W.A.J. Chapman, Workshop Technology Part I, II & III, 4th edition, Elsevier.
Essential References Materials	**Serope** Kalpakjian and **Steven Schmid**, Manufacturing Engineering and Technology, 6th edition, Prentice Hall.
Electronic Materials	Hajra Choudhury S.K and Hajra Choudhury. A.K., Elements of Workshop Technology, Volume I and II, Media Promoters and Publishers Private 1997

Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Air-conditioned rooms (20 seats)
Technology Resources (AV, data show, Smart Board, software, etc.)	Data whow
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Workshop Uniform Safety Equipment in workshop

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment	Students	Indirect
Extent of achievement of course learning outcomes	Faculty	Direct
Quality of learning resources	Students/Faculty/Peer Reviewer	Indirect

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA
T4
2020

Course Specifications

Course Title:	**Engineering Mechanics 1**
Course Code:	**ENG203**
Program:	**Bachelor of Science in Mechanical Engineering**
Department:	**Mechanical Engineering**
College:	**Faculty of Engineering**
Institution:	**University of Tabuk**

Table of Contents

A. Course Identification

1. Credit hours: 2							
2. Course type							
a.	University ☐	College ☒	Department ☐	Others ☐			
b.	Required ☒	Elective ☐					
3. Level/year at which this course is offered: 3/2							
4. Pre-requisites for this course (if any)**:** Phys 101							
5. Co-requisites for this course (if any)**:**							

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	30	100%
2	**Blended**	0	0
3	**E-learning**	0	0
4	**Distance learning**	0	0
5	**Other**	0	0

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	0
3	**Tutorial**	0
4	**Others** (specify)	0
	Total	30

B. Course Objectives and Learning Outcomes

1. Course Description

Basic concepts and principles of engineering mechanics; Vector analysis of forces; Moment and reduction of forces: moment and couples, reduction of a system force, equivalent system forces, equivalent couples; Equilibrium of particles in two and three dimensions; Equilibrium of rigid bodies; Analysis of trusses; Center of gravity and moment of inertia; Friction and its applications.

2. Course Main Objective

- Develop and understand of the basic engineering mechanics principles and apply this understanding, as well as their knowledge of mathematical principles.
- Apply principles of vector Algebra to solve problems involving force systems acting on a particle.
- Analyze and apply equations of equilibrium for a particle and for a rigid body.

- Analyze and draw free body diagrams for any system of forces acting on particles and rigid bodies.
- Determine the moment and couple of a force about a point and an axis in space.
- Apply concept of static equilibrium to calculate reactions in statically determinate structures.
- Calculate the forces in truss members using method of joints and method of sections
- Locate the centroid of different cross-sectional areas and lines.
- Analyze and diagram shear forces and bending moments of beams.
- Calculate the friction force and illustrate its applications.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1		
1.2		
1.3		
1...		
2	**Skills :**	
2.1	Apply principles of vector Algebra to solve problems involving force systems acting on a particle.	S1
2.2	Analyze the equilibrium of a rigid bodies.	S1
2.3	Analyze the structures	S1
2.4	Analyze and diagram shear forces and bending moments of beams.	S1
2.5	Calculate the friction force and illustrate its applications.	S1
3	**Values:**	
3.1		
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1.	General principles and fundamental Concepts.	2
2.	Force Vectors.	2
3.	Force Systems Resultant.	2
4.	Equilibrium of Particles	2
5.	Equilibrium of Rigid Body: two dimensions	2
6.	Equilibrium of Rigid Body: three dimensions	2
7.	Analyze the structures: methods of joints and sections	2
8.	Analyze the structures: frame and machines	
9.	Center of gravity and centroid	2
10.	Distributed Forces	2
11.	Analyze and diagram shear forces of beams.	2
12.	Analyze and diagram shear forces of beams- Applications	2
13.	Analyze and diagram bending moments of beams	2
14.	Analyze and diagram bending moments of beams: Applications	2
15.	Dry Friction	2

		2
		30

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1			
1.2			
…			
2.0	**Skills**		
2.1	Apply principles of vector Algebra to solve problems involving force systems acting on a particle.	Lecture, Problem based learning	● Classwork ● 1st Midterm Exams ● 2nd Midterm Exams Final Exam:
2.2	Analyze the equilibrium of a rigid bodies.		
2.3	Analyze the structures		
2.4	Analyze and diagram shear forces and bending moments of beams.		
2.5	Calculate the friction force and illustrate its applications.		
3.0	**Values**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Classwork	2 to 14	20 %
2	1st Midterm Exams	6	20 %
3	2nd Midterm Exams	11	20 %
4	Final Exam:	Last week	40 %

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:

The Mechanical Engineering Program (MEP) prioritizes the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	J.L. Meriam & L.G. Kraige Engineering Mechanics 7 edition Wiley plus
Essential References Materials	Beer, F.P. and Johnston, E.R. (2007) “Vector Mechanics for Engineers (Statics)”, McGraw-Hill.
Electronic Materials	1. Lecture handouts and presentation on blackboard (https://tabuk.blackboard.com/webapps/login/?action=relogin) 2. Interactive Simulations: ● PhET Interactive Simulations (https://phet.colorado.edu/) 3. Online Courses and Lectures: ● Coursera (https://www.coursera.org/) ● edX (https://www.edx.org/) ● Khan Academy (https://www.khanacademy.org/) **4. Educational YouTube Channels:** ● LearnEngineering (https://www.youtube.com/user/LearnEngineering) **Engineering Journals and Databases:** ● ASME: The American Society of Mechanical Engineers (https://www.asme.org/) ● ScienceDirect (https://www.sciencedirect.com/) **5. Virtual Labs:** ● Virtual Lab (http://www.vlab.co.in/) 6. **Engineering Software:** • AutoCAD (https://www.autodesk.com/products/autocad/overview) • SolidWorks (https://www.solidworks.com/) • Fusion 360 (https://www.autodesk.com/products/fusion-360/overview) • MATLAB (https://www.mathworks.com/products/matlab.html) • Python (https://www.python.org/) 7. **Mechanical Engineering Apps:** • Engineering Toolbox (https://www.engineeringtoolbox.com/) • Wolfram Alpha (https://www.wolframalpha.com/) 8. **Discussion Forums:** • Engineering Stack Exchange (https://engineering.stackexchange.com/) • Reddit - Mechanical Engineering (https://www.reddit.com/r/MechanicalEngineering/) 9. **Webinars and Conferences:** ASME Events (https://www.asme.org/events)

Other Learning Materials	1. **Lecture Notes and Tutorials:** • MIT OpenCourseWare (https://ocw.mit.edu/index.htm) • LectureNotes (https://lecturenotes.in/) 2. **Technical Blogs and Articles:** • Mechanical Engineering Blog (https://www.engineeringchoice.com/mechanical-engineering-blog/) • ASME's Mechanical Engineering Magazine (https://www.asme.org/topics-resources/society-news/asme-magazine) 3. **Industry Reports and Trends:** • McKinsey & Company - Mechanical Engineering (https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights) • Frost & Sullivan - Mechanical Engineering (https://ww2.frost.com/research/industry/mechanical-electrical/) 4. **Professional Organizations:** • Institution of Mechanical Engineers (IMechE) (https://www.imeche.org/) 5. **Technical Magazines:** • Mechanical Engineering Magazine (https://www.memagazine.org/) • Machine Design Magazine (https://www.machinedesign.com/) 6. **Interactive Learning Platforms:** • Chegg Study (https://www.chegg.com/study) • Quizlet (thttps://quizlet.com/)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms equipped with data show. White Board.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

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Course Specifications

Course Title:	Engineering Mechanics 2
Course Code:	ENG204
Program:	Bachelor of Science in Mechanical Engineering
Department:	Mechanical Engineering
College:	Faculty of Engineering
Institution:	University of Tabuk

Table of Contents

A. Course Identification

1. Credit hours: 2							
2. Course type							
a.	University ☐	College ☑	Department ☐	Others ☐			
b.	Required ☑	Elective ☐					
3. Level/year at which this course is offered: : 4/2							
4. Pre-requisites for this course (if any)**:** ENG203							
5. Co-requisites for this course (if any)**:** NA							

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	30	%100
2	Blended	0	0
3	E-learning	0	0
4	Distance learning	0	0
5	Other	0	0

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	0
3	**Tutorial**	0
4	**Others** (specify)	0
	Total	30

B. Course Objectives and Learning Outcomes

1. Course Description

This course is designed to provide the students with a working knowledge of particle & rigid-body mechanics under accelerated motion. and to train them in developing mathematical models (Free Body Diagrams) and in solving basic mechanics problems in a scientific and logical manner based on Newton’s Laws. Topics involve: analysis of position. Velocity. Acceleration. Use of Potential and Kinetic Energy along with Work to solve problems. Linear Impulse. General Plane Motion. Projectile Motion. Mass Moment of Inertia. Parallel-Axis. Impact problem solving and analysis. Angular Velocity. Relative Motion. Linear Momentum, Angular Acceleration.

2. Course Main Objective

On successful completion of this course, students should be able to:

- Student will demonstrate the ability to use vectors to sum forces and other physical quantities.
- Student will demonstrate an ability to draw free body diagrams for the purposes of determining internal forces in a system.
- student will demonstrate a good understanding of the kinematics, velocity and acceleration of a particle.
- student will demonstrate a good understanding & application of Newton second law in solving equation of motion.
- student will demonstrate a good understanding & application of the concepts of work, power and energy.
- student will demonstrate a good understanding & application of the concepts of impulse, momentum, and conservation of momentum in solving impact problems.
- Student will demonstrate a good understanding of absolute and relative velocity and acceleration in for several kind of rigid body motions.
- Student will demonstrate a good understanding of applying equation of motion for a rigid body under different types of planar motions.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1		
1.2		
1.3		
1...		
2	**Skills :**	
2.1	Perform calculations-involving kinematics of a particle.	S1
2.2	Formulate equations of motion using Newton's second law via free body diagram.	S1
2.3	Solve problems involving changes of a particle motion due to the action of external forces using work and energy concepts.	S1
2.4	Perform calculations related to impulse and momentum of a particle's motion.	S1
2.5	Perform calculations involving planar kinematics of a rigid body.	S1
3	**Values:**	
3.1		
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to mechanics, Kinematic , vector analysis	2
2.	Rectilinear motion analysis: position, velocity	2
3.	Rectilinear motion analysis: acceleration	2
4.	Curvilinear motion absolute-dependent analysis	2
5.	Curvilinear motion analysis relative motion analysis	2

6.	Newton law of motion, Free-Body diagram	2
7.	Definition of Work of a force	2
8.	Principle of Work	6
9.	Principle of energy	2
10.	Power of machine and efficiency	2
11.	Impulse analysis, impact between two bodies	2
12.	momentum analysis, impact between two bodies	2
13	Kinematics of rigid body, relative velocity	2
14.	Kinematics of rigid body, acceleration analysis	2
15.	Case study Problem solving	2
Total		30

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1			
1.2			
…			
2.0	**Skills**		
2.1	Perform calculations-involving kinematics of a particle.	Lectures, Problem-based learning,	• Classwork • 1st Midterm Exams • 2nd Midterm Exams • Final Exam:
2.2	Formulate equations of motion using Newton's second law via free body diagram.		
2.3	Solve problems involving changes of a particle motion due to the action of external forces using work and energy concepts.		
2.4	Perform calculations related to impulse and momentum of a particle's motion.		
2.5	Perform calculations involving planar kinematics of a rigid body.		
3.0	**Values**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Classwork	2 to 14	20
2	1st Midterm Exams	6	20

#	Assessment task*	Week Due	Percentage of Total Assessment Score
3	2nd Midterm Exams	11	20
4	Final Exam:	Last week	40
5			
6			
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

The Mechanical Engineering Program (MEP) prioritize the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Engineering Mechanics: Dynamics by R.C. Hibbler, Pearson, 14th edition.
Essential References Materials	Engineering Mechanics: Dynamics 8th Edition, James L. Meriam (Author), L. G. Kraige (Author), J. N. Bolton (Author).
Electronic Materials	1. Lecture handouts and presentation on blackboard (https://tabuk.blackboard.com/webapps/login/?action=relogin) 2. Interactive Simulations: • PhET Interactive Simulations (https://phet.colorado.edu/) 3. Online Courses and Lectures: • Coursera (https://www.coursera.org/) • edX (https://www.edx.org/) • Khan Academy (https://www.khanacademy.org/) **4. Educational YouTube Channels:** • LearnEngineering (https://www.youtube.com/user/LearnEngineering) **Engineering Journals and Databases:**

	• ASME: The American Society of Mechanical Engineers (https://www.asme.org/) • ScienceDirect (https://www.sciencedirect.com/) **5. Virtual Labs:** • Virtual Lab (http://www.vlab.co.in/) 6. **Engineering Software:** • AutoCAD (https://www.autodesk.com/products/autocad/overview) • SolidWorks (https://www.solidworks.com/) • Fusion 360 (https://www.autodesk.com/products/fusion-360/overview) • MATLAB (https://www.mathworks.com/products/matlab.html) • Python (https://www.python.org/) 7. **Mechanical Engineering Apps:** • Engineering Toolbox (https://www.engineeringtoolbox.com/) • Wolfram Alpha (https://www.wolframalpha.com/) 8. **Discussion Forums:** • Engineering Stack Exchange (https://engineering.stackexchange.com/) • Reddit - Mechanical Engineering (https://www.reddit.com/r/MechanicalEngineering/) 9. **Webinars and Conferences:** ASME Events (https://www.asme.org/events)
Other Learning Materials	1. **Lecture Notes and Tutorials:** • MIT OpenCourseWare (https://ocw.mit.edu/index.htm) • LectureNotes (https://lecturenotes.in/) 2. **Technical Blogs and Articles:** • Mechanical Engineering Blog (https://www.engineeringchoice.com/mechanical-engineering-blog/) • ASME's Mechanical Engineering Magazine (https://www.asme.org/topics-resources/society-news/asme-magazine) 3. **Industry Reports and Trends:** • McKinsey & Company - Mechanical Engineering (https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights) • Frost & Sullivan - Mechanical Engineering (https://ww2.frost.com/research/industry/mechanical-electrical/) 4. **Professional Organizations:** • Institution of Mechanical Engineers (IMechE) (https://www.imeche.org/) 5. **Technical Magazines:** • Mechanical Engineering Magazine (https://www.memagazine.org/) • Machine Design Magazine (https://www.machinedesign.com/) 6. **Interactive Learning Platforms:** • Chegg Study (https://www.chegg.com/study)

	• Quizlet (thttps://quizlet.com/)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms equipped with data show. White Board.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

Course Specifications

Course Title:	**Introduction to Engineering Design 1**
Course Code:	**ENG205**
Program:	**Bachelor of Science in Mechanical Engineering**
Department:	**Mechanical Engineering**
College:	**Faculty of Engineering**
Institution:	**University of Tabuk**

Table of Contents

A. Course Identification

1. Credit hours: **3**
2. Course type **a.** University ☐ College √ Department ☐ Others ☐ **b.** Required √ Elective ☐
3. Level/year at which this course is offered: 3/2
4. Pre-requisites for this course (if any)**:** MATH 101 & ELS 002
5. Co-requisites for this course (if any)**:** **None**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	60	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	30
3	**Tutorial**	
4	**Others** (specify)	
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

Introduction to active learning: team work, team dynamics, team norms and communication, conducting effective meetings and quality assessment; Problem solving procedure: problem definition, generation of solutions, selection methodology, solution implementation, assessment of implementation; semester project.

2. Course Main Objective

At the end of the course the students will be able to:

- Develop and exhibit the behaviors associated with taking personal responsibility for time
- management, classroom expectations, professional and ethical behaviors in the class, and academic integrity,

- practice elements of active learning as well as apply active learning techniques such as Engineering Journal, Facilitator Signal, and Process Check,

- Use effective team's tools such as team norms,meeting's agenda , minutes and team process check as well as team dynamics tools.

- Explain problem solving strategies such as using heuristic, perceiving problems, potential problem, real problem, etc.
- Describe the tools and methods used throughout problem definition, solution, and evaluation stages.
- Practicing the communication skills in oral and written presentations of semester project and other presentations.

3. Course Learning Outcomes

	CLOs	AlignedPLOs
1	**Knowledge and Understanding**	
1.1	Describe the tools and methods used throughout problem definition and solving and evaluation strategies	K1
1.2	Explain the strategies for active learning	K1
1.3		
1...		
2	**Skills :**	
2.1	Apply the problem solving strategies such as using the five block of the heuristics	S1
2.2	Apply the elements of active learning as well as apply active learning techniques such as Engineering Journal, Facilitator Signal, and Process Check,.	S1
2.3	Communicate orally and in writing effectively.	S3
2.4		
2.5		
2.6		
3	**Values:**	
3.1		
3.2	Use effective team's tools such as team norms, meeting's agenda , minutes and team process check as well as team dynamics tools	V3
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1.	course materials, teaming, and course assessment	4
2.	Problem solving strategies: why bother	4
3.	Getting started	4
4.	Problem definition: theory	4
5.	Problem definition: applications	4
7.	Generation solution: theory	4
8.	Generation solution: applications	4
9.	Decision	4
10.	Implementation	4

11.	Evaluation	4
12.	practice elements of active learning as well as apply active learning techniques such as Engineering Journal, Facilitator Signal, and Process Check,	4
13.	team norms, meeting's agenda , minutes and team process check as well as team dynamics tools.	4
14.	Semester project presentation: session 1	4
15.	Semester project presentation: session 2	4
Total		60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Describe the tools and methods used throughout problem definition and solving and evaluation strategies	Lecture	• Classwork
1.2	Explain the strategies for active learning		
…			
2.0	**Skills**		
2.1	Apply the problem solving strategies such as using the five block of the heuristics	Lecture, Problem solving based learning. Project based learning	• Classwork, mini-project
2.2	Apply the elements of active learning as well as apply active learning techniques such as Engineering Journal, Facilitator Signal, and Process Check,.	Lecture, Problem solving based learning. Project based learning	• Classwork, mini-project
2.3	Communicate orally and in writing effectively.	Lecture, Project based learning	• Report and presentation
3.0	**Values**		
3.1	Use effective team's tools such as team norms, meeting's agenda , minutes and team process check as well as team dynamics tools	Lecture, Project based learning	• presentation
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Classwork	2 to 14	50%
2	Mini project	Last week	30%
3	Presentation	Last week	20%
4			
5			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice : The Mechanical Engineering Program (MEP) prioritize the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	**STRATEGIES FOR CREATIVE PROBLEM SOLVING,** Fogler, H.S., LeBlanc, S., E.,, 2th Ed., 2007, Prentice Hall PTR ISBN 978-0130082794.
Essential References Materials	**INTRODUCTION TO ENGINEERING DESIGN,** McNeill, B. W., Bellamy, L., Burrows, V. A.,2004, King Abdulaziz University Press.
Electronic Materials	1. Lecture handouts and presentation on blackboard (https://tabuk.blackboard.com/webapps/login/?action=relogin) 2. Interactive Simulations: • PhET Interactive Simulations (https://phet.colorado.edu/) 3. Online Courses and Lectures: • Coursera (https://www.coursera.org/) • edX (https://www.edx.org/) • Khan Academy (https://www.khanacademy.org/) **4. Educational YouTube Channels:** • LearnEngineering (https://www.youtube.com/user/LearnEngineering) **Engineering Journals and Databases:** • ASME: The American Society of Mechanical Engineers (https://www.asme.org/) • ScienceDirect (https://www.sciencedirect.com/) **5. Virtual Labs:** • Virtual Lab (http://www.vlab.co.in/) 6. **Engineering Software:** • AutoCAD (https://www.autodesk.com/products/autocad/overview) • SolidWorks (https://www.solidworks.com/) • Fusion 360 (https://www.autodesk.com/products/fusion-360/overview)

	• MATLAB (https://www.mathworks.com/products/matlab.html) • Python (https://www.python.org/) 7. **Mechanical Engineering Apps:** • Engineering Toolbox (https://www.engineeringtoolbox.com/) • Wolfram Alpha (https://www.wolframalpha.com/) 8. **Discussion Forums:** • Engineering Stack Exchange (https://engineering.stackexchange.com/) • Reddit - Mechanical Engineering (https://www.reddit.com/r/MechanicalEngineering/) 9. **Webinars and Conferences:** ASME Events (https://www.asme.org/events)
Other Learning Materials	1. **Lecture Notes and Tutorials:** • MIT OpenCourseWare (https://ocw.mit.edu/index.htm) • LectureNotes (https://lecturenotes.in/) 2. **Technical Blogs and Articles:** • Mechanical Engineering Blog (https://www.engineeringchoice.com/mechanical-engineering-blog/) • ASME's Mechanical Engineering Magazine (https://www.asme.org/topics-resources/society-news/asme-magazine) 3. **Industry Reports and Trends:** • McKinsey & Company - Mechanical Engineering (https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights) • Frost & Sullivan - Mechanical Engineering (https://ww2.frost.com/research/industry/mechanical-electrical/) 4. **Professional Organizations:** • Institution of Mechanical Engineers (IMechE) (https://www.imeche.org/) 5. **Technical Magazines:** • Mechanical Engineering Magazine (https://www.memagazine.org/) • Machine Design Magazine (https://www.machinedesign.com/) 6. **Interactive Learning Platforms:** • Chegg Study (https://www.chegg.com/study) • Quizlet (thttps://quizlet.com/)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms equipped with data show. White Board.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show.

Item	Resources
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	None

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes,Quality oflearning resources, etc.)
Evaluators (Students,Faculty, Program Leaders,Peer Reviewer, Others (specify)
Assessment Methods(Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

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Course Specifications

Course Title:	**Introduction to Engineering Design 2**
Course Code:	**ENG213**
Program:	**Bachelor of Science in Mechanical Engineering**
Department:	**Mechanical Engineering**
College:	**Faculty of Engineering**
Institution:	**University of Tabuk**

Table of Contents

A. Course Identification

1. Credit hours:	**2**						
2. Course type							
a.	University	☐	College	√	Department	☐	Others ☐
b.	Required	x	Elective	☐			
3. Level/year at which this course is offered:	**4/2**						
4. Pre-requisites for this course (if any)**:** Eng205 introduction to engineering design							
5. Co-requisites for this course (if any)**:** **None**							

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	30	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Others** (Practical)	0
	Total	30

B. Course Objectives and Learning Outcomes

1. Course Description

Continuation of engineering design I course goals which include: self-regulation, communication, working cooperatively and collaboratively; introduction to engineering methods; engineering problem solving; creating computational models in order to solve problems; ability to design a system to solve an engineering problem.

2. Course Main Objective

This course focuses on problem modeling and solving. It encourages the students to build a computational model and solve it using modern tools such as excel spreadsheet.

3. Course Learning Outcomes

	CLOs	Aligned-PLOs
1	**Knowledge and Understanding**	
1.1	Recognize the needed heuristic to solve a problem	K1
1.2	Describe the descriptive model to represent the problem	K1
1.3		
2	**Skills :**	
2.1	Build a computational model to solve an engineering problem	S1
2.2	Use spread sheet to design and implement the solution of suggested models of an engineering problem	S2
2.3	Present and document engineering solutions properly	S4
2...		
3	**Values:**	
3.1	Demonstrate professional responsibilities in solving an engineering problem.	V1
3.2	Function on multidisciplinary team to solve an engineering problem	V2
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1.	Modeling concepts	2
2.	Modeling concepts	2
3.	Modeling and solution of reading a book problem	2
4.	Modeling and solution of reading a book problem	2
5.	Using excel sheet to implement the model of the suggested solution	2
7.	Using excel sheet to implement the model of the suggested solution	2
8.	Set a model to solve the Ping Pong problem	2
9.	Set a model to solve the Ping Pong problem	2
10.	Design the solution model of the tank of the gas problem	2
11.	Design the solution model of the tank of the gas problem	2
12.	Set a Model for the bottle cooling	2
13.	Engineering Project design procedure	2
14.	Building a prototype to meet the designing objectives	2
15.	Project prototype presentation	2
	Total	30

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**		
1.1	Recognize the needed heuristic to solve a problem	Lectures	Classwork
1.2	Describe the descriptive model to represent the problem	Lectures	Classwork
…			
2.0	**Skills**		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.1	Build a computational model to solve an engineering problems	Lecture, Problem solving based learning. Project based learning	Classwork Mini project
2.2	Use spread sheet to design and implement the solution of suggested models of an engineering problem	Lecture, Problem solving based learning. Project based learning	Classwork Mini project
…	Present and document engineering solutions properly	Lecture, Problem solving based learning. Project based learning	Classwork Mini project
3.0	**Values**		
3.1			
3.2	Demonstrate professional responsibilities in solving an engineering problem	Lecture, Problem solving based learning. Project based learning	Classwork Mini project
3.3	Function on multidisciplinary team to solve an engineering problem	Lecture, Problem solving based learning. Project based learning	Classwork Mini project

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Classwork	2 to 14	50%
2	Mini -project/prototype	Last week	50%
3			
4			
5			
6			
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

The Mechanical Engineering Program (MEP) prioritize the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	How to Model It, Antony M Starfield, Karl A Smith, Andrew L Belloc, McGraw Hill, 1994
Essential References Materials	• Handouts
Electronic Materials	1. Lecture handouts and presentation on blackboard (https://tabuk.blackboard.com/webapps/login/?action=relogin) 2. Interactive Simulations: • PhET Interactive Simulations (https://phet.colorado.edu/) 3. Online Courses and Lectures: • Coursera (https://www.coursera.org/) • edX (https://www.edx.org/) • Khan Academy (https://www.khanacademy.org/) **4. Educational YouTube Channels:** • LearnEngineering (https://www.youtube.com/user/LearnEngineering) **Engineering Journals and Databases:** • ASME: The American Society of Mechanical Engineers (https://www.asme.org/) • ScienceDirect (https://www.sciencedirect.com/) **5. Virtual Labs:** • Virtual Lab (http://www.vlab.co.in/) 6. **Engineering Software:** • AutoCAD (https://www.autodesk.com/products/autocad/overview) • SolidWorks (https://www.solidworks.com/) • Fusion 360 (https://www.autodesk.com/products/fusion-360/overview) • MATLAB (https://www.mathworks.com/products/matlab.html) • Python (https://www.python.org/) 7. **Mechanical Engineering Apps:** • Engineering Toolbox (https://www.engineeringtoolbox.com/) • Wolfram Alpha (https://www.wolframalpha.com/) 8. **Discussion Forums:** • Engineering Stack Exchange (https://engineering.stackexchange.com/) • Reddit - Mechanical Engineering (https://www.reddit.com/r/MechanicalEngineering/) 9. **Webinars and Conferences:** ASME Events (https://www.asme.org/events)
Other Learning Materials	1. **Lecture Notes and Tutorials:** • MIT OpenCourseWare (https://ocw.mit.edu/index.htm) • LectureNotes (https://lecturenotes.in/) 2. **Technical Blogs and Articles:** • Mechanical Engineering Blog (https://www.engineeringchoice.com/mechanical-engineering-blog/) • ASME's Mechanical Engineering Magazine (https://www.asme.org/topics-resources/society-news/asme-magazine) 3. **Industry Reports and Trends:** • McKinsey & Company - Mechanical Engineering (https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights) • Frost & Sullivan - Mechanical Engineering (https://ww2.frost.com/research/industry/mechanical-electrical/) 4. **Professional Organizations:** • Institution of Mechanical Engineers (IMechE) (https://www.imeche.org/) 5. **Technical Magazines:** • Mechanical Engineering Magazine (https://www.memagazine.org/)

	• Machine Design Magazine (https://www.machinedesign.com/) 6. **Interactive Learning Platforms:** • Chegg Study (https://www.chegg.com/study) • Quizlet (thttps://quizlet.com/)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms equipped with data show. White Board.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Workshop

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

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Course Specifications

Course Title:	**Engineering Economy**
Course Code:	**ENG 214**
Program:	**Bachelor of Science in Mechanical Engineering**
Department:	**Mechanical Engineering**
College:	**Faculty of Engineering**
Institution:	**University of Tabuk**

Table of Contents

A. Course Identification

1. Credit hours: 2							
2. Course type							
a.	University		College	√	Department		Others
b.	Required	√	Elective				
3. Level/year at which this course is offered: 6/3							
4. Pre-requisites for this course (if any)**: ENG 213**							
5. Co-requisites for this course (if any)**:**							

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	**2**	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	**30**
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Others** (specify)	
	Total	**30**

B. Course Objectives and Learning Outcomes

1. Course Description

Principles of engineering economy. Money time relationships, compound interest rates, Single amounts and uniform series, Arithmetic series, Cost terminology and cost estimation techniques. Engineering economy techniques for Depreciation.

2. Course Main Objective

1. **Understanding Fundamentals:**
   - Develop a fundamental understanding of engineering economy, emphasizing the principles that guide financial decision-making in engineering projects.
2. **Money-Time Relationships:**
   - Comprehend the relationships between money and time, particularly the concept of compound interest rates and their impact on financial decisions.
3. **Single Amounts and Uniform Series:**
   - Apply engineering economy techniques to analyze and solve problems related to single amounts and uniform series of cash flows.

4. **Arithmetic Series:**
    - Gain proficiency in handling arithmetic series in the context of engineering economy, considering their application in various financial scenarios.
5. **Cost Terminology and Estimation:**
    - Familiarize students with essential cost terminology and equip them with techniques for accurate cost estimation in engineering projects.
6. **Depreciation Models:**
    - Understand and apply depreciation and depletion models in engineering economy, considering their implications for financial analysis and decision-making.
7. **Introduction to Engineering Economy and the Natural Environment:**
    - Explore the relationship between engineering economy principles and their impact on the natural environment, emphasizing sustainable and environmentally conscious decision-making.
8. **Time Value of Money:**
    - Grasp the concept of the time value of money and its significance in engineering economic analysis, including techniques for comparing cash flows over different time periods.
9. **Uniform Series and Arithmetic Series:**
    - Apply engineering economy principles to analyze and solve problems involving uniform series and arithmetic series of cash flows.
10. **Cash Flow Diagram (CFD):**
    - Develop the skill to create and interpret cash flow diagrams as a visual representation of financial scenarios, aiding in decision-making processes.
11. **Nominal vs Effective Interest Formulas:**
    - Differentiate between nominal and effective interest rates, and understand their applications in financial calculations.
12. **Economic and Cost Concepts:**
    - Explore various economic and cost concepts relevant to engineering projects, including concepts such as inflation, escalation, and opportunity cost.
13. **Cost Estimation Techniques:**
    - Acquire proficiency in using different cost estimation techniques applicable to engineering projects, ensuring accuracy in project budgeting.
14. **Integration of Engineering and Economy:**
    - Understand the integration of engineering principles with economic considerations, recognizing the interdisciplinary nature of decision-making in engineering projects.
15. **Ethical Considerations:**
    - Discuss and understand the ethical considerations related to financial decision-making in engineering, emphasizing responsible and transparent practices.

By achieving these objectives, students will be well-equipped to apply engineering economy principles in real-world scenarios, make informed financial decisions, and consider the environmental impact of their engineering projects.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Demonstrate knowledge of the fundamental relationship between environment and Economy	**K1**
1.2		

CLOs		Aligned PLOs
1.3		
2	**Skills :**	
2.1	Analyze cash-flow diagram	**S1**
2.2	Analyze different interest rates (Simple, compound, Equal and uniform Series, Arithmetic gradient, geometric gradient)	**S1**
2.3	Estimate Costs by different Techniques.	**S1**
2.4	Analyze depreciation and depletion models	**S1**
3	**Values:**	
3.1		
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Introduction to Engineering Economy: Definition, scope, and importance of engineering economy in decision-making.	**2**
2	Money-Time Relationships: Time value of money, interest rates, and their impact on financial decisions.	**2**
3	Single Amounts and Uniform Series: Analysis and calculations involving single amounts and uniform series of cash flows.	**2**
4	Arithmetic Series in Engineering Economy: Application of arithmetic series to engineering economic problems.	**2**
5	Cost Terminology: Understanding and using key cost terminology in engineering projects.	**2**
6	Cost Estimation Techniques: Methods for estimating costs in engineering projects, including historical costing and parametric estimation.	**2**
7	Depreciation and Depletion Models: Types of depreciation and depletion models and their application in financial analysis.	**2**
8	Introduction to the Natural Environment: Consideration of environmental factors and sustainability in engineering economy.	**2**
9	Time Value of Money Concepts: Present worth, future worth, and annual worth calculations.	**2**
10	Uniform Series and Arithmetic Series Applications: Solving engineering economic problems involving uniform series and arithmetic series.	**2**
11	Cash Flow Diagrams (CFD): Creation and interpretation of cash flow diagrams as visual aids for decision-making.	**2**
12	Nominal vs Effective Interest Rates: Differentiating between nominal and effective interest rates and their significance.	**2**
13	Economic and Cost Concepts: Exploration of economic concepts like inflation, escalation, and opportunity cost.	**2**
14	Integration of Engineering and Economy: Understanding the intersection of engineering principles and economic considerations.	**2**
15	Ethical Considerations in Engineering Economy: Discussion of ethical issues and responsible decision-making in financial contexts.	**2**
Total		**30**

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Demonstrate knowledge of the fundamental relationship between environment and Economy	Lectures	• Classwork • Midterm Exams Final Exam:
2.0	**Skills**		
2.1	Analyze cash-flow diagram	Problem solving based learning	• Classwork • Midterm Exams Final Exam:
2.2	Analyze different interest rates (Simple, compound, Equal and uniform Series, Arithmetic gradient, geometric gradient)	Problem solving based learning	• Classwork • Midterm Exams Final Exam:
2.3	Estimate Costs by different Techniques.	Problem solving based learning	• Classwork • Midterm Exams Final Exam:
	Analyze depreciation and depletion models	Problem solving based learning	• Classwork • Midterm Exams • Final Exam:
3.0	**Values**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Classwork	2 to 14	20
2	1st Midterm Exams	6	20
3	2nd Midterm Exams	11	20
4	Final Exam:	Last week	40

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

The Mechanical Engineering Program (MEP) prioritize the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	• Blank, B., and Tarquin, A.," Basics of Engineering Economy" McGraw-Hill, 2012.
Essential References Materials	• Gerald J. Thuesen and W. J. Fabrycky " Engineering Economy" 9 th Edition, Prentice Hall, 2001
Electronic Materials	1. Attach List: Course materials will be distributed by the lecturer and notes 2. Lecture handouts and presentation on blackboard (https://tabuk.blackboard.com/webapps/login/?action=relogin) 3. Online Courses and Lectures: • Coursera (https://www.coursera.org/) • edX (https://www.edx.org/) • Khan Academy (https://www.khanacademy.org/)
Other Learning Materials	1. **Lecture Notes and Tutorials:** • MIT OpenCourseWare (https://ocw.mit.edu/index.htm) • LectureNotes (https://lecturenotes.in/) 2. **Interactive Learning Platforms:** • Chegg Study (https://www.chegg.com/study) • Quizlet (thttps://quizlet.com/)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Classroom and some lab is available
Technology Resources (AV, data show, Smart Board, software, etc.)	• Data show is available in each classroom
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	• None

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Quality of learning resources	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

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Course Specifications

Course Title:	**Engineering Management**
Course Code:	**ENG215**
Program:	**Bachelor of Science in Mechanical Engineering**
Department:	**Mechanical Engineering**
College:	**Faculty of Engineering**
Institution:	**University of Tabuk**

Table of Contents

A. Course Identification

1. Credit hours: 2								
2. Course type								
a.	University	☐	College	√	Department	☐	Others	☐
b.	Required	√	Elective	☐				
3. Level/year at which this course is offered: 10/5								
4. Pre-requisites for this course (if any)**: ENG214**								
5. Co-requisites for this course (if any)**:**								

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	2	**100%**
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	**30**
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Others** (specify)	
	Total	**30**

B. Course Objectives and Learning Outcomes

1. Course Description:

Introduction to engineering management. Function of management, planning, organizing, communicating, motivating, leading and controlling. Time and cost management. Network logic and development. Critical path method. Activity on Node. Project Evaluation and Review Techniques (PERT). Crashing of project management. Legal aspects of contracts.

2. Course Main Objective

1. **Introduction to Engineering Management:**
2. Provide students with a foundational understanding of engineering management, emphasizing its role in the successful execution of projects.
3. **Functions of Management:**
4. Explore the core functions of management, including planning, organizing, communicating, motivating, leading, and controlling, and their application in engineering contexts.
5. **Time and Cost Management:**
6. Understand the principles of time and cost management in engineering projects, emphasizing efficient resource allocation and budgetary considerations.
7. **Network Logic and Development:**
8. Introduce network logic and development techniques to facilitate the visual representation of project activities, dependencies, and critical paths.
9. **Critical Path Method (CPM):**
10. Explore the Critical Path Method as a project management tool, enabling students to identify and prioritize critical tasks for project success.
11. **Activity on Node:**
12. Understand and apply the Activity on Node technique in project management, emphasizing the graphical representation of project activities.
13. **Project Evaluation and Review Techniques (PERT):**
14. Introduce Project Evaluation and Review Techniques (PERT) as a method for analyzing and scheduling uncertain activities in engineering projects.
15. **Crashing of Project Management:**
16. Explore the concept of crashing in project management, focusing on strategies to accelerate project schedules while minimizing costs.
17. **Legal Aspects of Contracts:**
18. Provide insight into the legal aspects of contracts in engineering projects, covering key principles, considerations, and best practices.

By achieving these objectives, students will develop a comprehensive understanding of engineering management principles and practices, equipping them with the knowledge and skills necessary to effectively plan, execute, and control engineering projects. This course aims to prepare students for managerial roles within engineering contexts and instill a solid foundation for successful project management.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Demonstrate knowledge of fundamental Engineering management.	K1
1.2	Demonstrate project management framework	K1
1.3		
1...		
2	**Skills :**	
2.1	Analyze the cost control	S1
2.2	Calculate project critical path to schedule the project using the following techniques Gantt (bar chart), AON and PERT method.	S1
2.3		

CLOs		Aligned PLOs
2...		
3	**Values:**	
3.1	Demonstrate engineering contracts and professional ethics.	V2
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Introduction to Engineering Management:Overview of the role and significance of engineering management in project success.	**2**
2	Functions of Management:Detailed exploration of management functions, including planning, organizing, communicating, motivating, leading, and controlling.	**2**
3	Time Management:Principles and techniques for efficient time management in engineering projects.	**2**
4	Cost Management:Budgetary considerations, cost estimation, and financial management in engineering projects.	**2**
5	Network Logic and Development:Understanding and application of network logic in project planning and development.	**2**
6	Critical Path Method (CPM):In-depth study of CPM, emphasizing its role in identifying critical tasks and project scheduling.	**2**
7	Activity on Node:Application of Activity on Node technique for graphical representation and analysis of project activities.	**2**
8	Project Evaluation and Review Techniques (PERT):Principles and application of PERT for scheduling uncertain activities in engineering projects.	**2**
	Crashing of Project Management:Strategies and considerations for crashing project schedules while minimizing costs.	**2**
...	Legal Aspects of Contracts:Exploration of legal principles and considerations in engineering project contracts.	**2**
	Engineering Project Planning:Techniques for effective project planning, considering resource allocation and project scope.	**2**
	Organizational Structures in Engineering Projects:Understanding different organizational structures and their impact on project management.	**2**
	Risk Management in Engineering Projects:Identification, assessment, and mitigation of risks in engineering projects.	**2**
	Communication in Project Management:Effective communication strategies for project managers within engineering teams.	**2**
	Ethics in Engineering Management:Examination of ethical considerations and professional conduct in engineering project management	**2**
Total		**30**

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Recognize the knowledge area of engineering management	**Lectures**	Classwork Midterm exams Final Exam
1.2	Write the requirement of feasibility study and engineering contract	**Lectures**	Classwork Midterm exams Final Exam
…			
2.0	**Skills**		
2.1	Apply the knowledge of engineering management area and their responsibilities and techniques	**Lectures**	Classwork Midterm exams Final Exam
2.2	Describe he different available planning techniques such as Bar char, AON, PERT	**Lectures**	Classwork Midterm exams Final Exam
…			
3.0	**Values**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Classwork		**30%**
2	Midterm exams		**30%**
3	Final Exame		**40%**
4			
5			
6			
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

- **More office hours**
- **Email, when it is requested**

Individual Academic Advising:

- Provide one-on-one academic advising sessions to discuss individual student progress, address concerns, and set academic goals.

Feedback Mechanism:

- Establish a feedback mechanism for students to express concerns, provide suggestions, and communicate any issues related to the course.

Online Learning Resources:

• Curate a list of online resources, tutorials, and forums where students can seek additional help and clarification on course concepts.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	• Lester, A, "Project Management, Planning and Control", 5th Edition, Butterworth Heinemann, 2010
Essential References Materials	1. Lucy, C. Morse and Daniel L., Babcock," Managing Engineering and Technology, An introduction to Management for Engineers, 5th Edition, 2010.
Electronic Materials	1. Attach List: Course materials will be distributed by the lecturer and notes 2. Lecture handouts and presentation on blackboard (https://tabuk.blackboard.com/webapps/login/?action=relogin) 3. Online Courses and Lectures: • Coursera (https://www.coursera.org/) • edX (https://www.edx.org/) • Khan Academy (https://www.khanacademy.org/) •
Other Learning Materials	1. **Lecture Notes and Tutorials:** • MIT OpenCourseWare (https://ocw.mit.edu/index.htm) • LectureNotes (https://lecturenotes.in/) 2. **Interactive Learning Platforms:** • Chegg Study (https://www.chegg.com/study) • Quizlet (thttps://quizlet.com/)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Classroom and some lab is available
Technology Resources (AV, data show, Smart Board, software, etc.)	• Data show is available in each classroom
Other Resources	• None

Item	Resources
(Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Quality of learning resources	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA
T4
2020

Course Specifications

Course Title:	Mathematics 1
Course Code:	MATH 100
Program:	General course
Department:	Mathematics
College:	Science
Institution:	University of Tabuk

Table of Contents

A. Course Identification

1. Credit hours: **03 Hours/Week**	
2. Course type **a.** University ☐ College ☑ √ Department ☐ Others ☐ **b.** Required √ Elective ☐	
3. Level/year at which this course is offered: **L1/Y1**	
4. Pre-requisites for this course (if any): None	
5. Co-requisites for this course (if any)**:** None	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	45 Hrs.	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	45
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Others** (specify)	
	Total	45

B. Course Objectives and Learning Outcomes

1. Course Description

This course is designed to help students develop Pre-calculus skills to a significant depth and prepare them for higher level mathematics courses. The course cover topics of algebra II for collage level. The course contains include an introduction to the concept of absolute value, complex number, functions and limits.

2. Course Main Objective

-Students will be able to recall basic algebraic rules and operations.
-Students will be able to solve a variety of algebraic problems.
-Students will be able to recognize all the basic functions and operations on them.
-Students will be able to work with complex numbers.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Recall the definition of absolute value, elementary functions such as quadratic, trigonometric, exponential, logarithmic and their graphs.	ILO1
1.2	Recognize the role of some concepts such as complex numbers	ILO1

CLOs		Aligned PLOs
2	**Skills**	
2.1	Apply the basic algebra skills to solve mathematical problems.	ILO1
2.2	Solve linear equations and inequalities including absolute value, quadratic, radical, exponential and logarithmic functions	ILO1
2.3	Manipulate the elementary rules in triangles, and circles, and thus deduce the trigonometric identities easily	ILO1
2.4	Prove simple statements using mathematical induction	ILO1
2.5	Apply the knowledge of sequences in a variety of contexts	ILO1
3	**Values:(Interpersonal Skills & Responsibility)**	
3.1	Take responsibility to work independently and with other members of the group	ILO8- ILO10
3.2	Demonstrate time management in self-study.	ILO9

C. Course Content

No	List of Topics	Contact Hours
1	The Absolute Value	3 Hrs
2	Complex Numbers	3 Hrs
3	Functions	3 Hrs
4	Graphing Functions - Odd and Even Functions	3 Hrs
5	Quadratic Functions	3 Hrs
6	**Mid-Exam 1**	
6	Operations on Functions	3 Hrs
7	Inverse Functions	3 Hrs
8	Log. Functions	3 Hrs
9	Exp. & Log. Equations	3 Hrs
10	Solving Right Triangles	3 Hrs
11	Introduction to Limits	3 Hrs
11	**Mid-Exam 2**	
12	Computing Limits Algebraically	3 Hrs
13	Limits at Infinity	3 Hrs
14&15	**Revision & Final Exam**	6 Hrs
Total		**45 Hrs**

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Students will be able to recall the definition of absolute value, elementary functions such as quadratic, trigonometric, exponential, logarithmic and their graphs.	Lectures Class Discussions	Quizzes Midterm Exam Final Exam
1.2	Students will be able to recognize the role of some concepts such as complex numbers	Lectures Class Discussions	Quizzes Midterm Exam Final Exam
2.0	**Skills**		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.1	Students will be able to apply the basic algebra skills to solve mathematical problems.	Lectures Class Discussions Cooperative learning Assign tasks	Quizzes Midterm Exam Final Exam Homeworks
2.2	Students will be able to solve linear equations and inequalities including absolute value, quadratic, radical, exponential and logarithmic functions	Lectures Class Discussions Cooperative learning Assign tasks	Quizzes Midterm Exam Final Exam Homeworks
2.3	Students will be able to manipulate the elementary rules in triangles, and circles, and thus deduce the trigonometric identities easily	Lectures Class Discussions Cooperative learning Assign tasks	Quizzes Midterm Exam Final Exam Homeworks
2.4	Students will be able to prove simple statements using mathematical induction	Lectures Class Discussions Cooperative learning Assign tasks	Quizzes Midterm Exam Final Exam Homeworks
2.5	Students will be able to apply the knowledge of sequences in a variety of contexts	Lectures Class Discussions Cooperative learning Assign tasks	Quizzes Midterm Exam Final Exam Homeworks
3.0	**Values**		
3.1	Students will take responsibility to work independently and with other members of the group	Cooperative learning Assign tasks	Homeworks Class participation Essay
3.2	Students will be able to demonstrate responsibility to solve given assignments on their own and submit the solution on time.	Cooperative learning Assign tasks	Homeworks Class participation Essay

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Activities	Weekly basis	5%
2	Home works	Weekly basis	5%
3	Quizzes	Weekly basis	10%
2	Mid Exam-I	6th week	20%
3	Mid Exam-II	11th week	20%
4	Final Exam	At end of the Semester	40%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :
Six office hours per week in the lecturer schedule.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Pre-Calculus, Tabuk University, Mc Grw Hill. ISBN-10:1121296505, 2011

Essential References Materials	Courant, Richard, and Fritz John. Introduction to calculus and analysis I. Springer Science & Business Media, 2012. David C. Lay. Linear Algebra and its Applications. Addison Wesley, 2003. H. Anton. Elementary Linear Algebra . John Wiley 2001. S. Lipschutz. Theory and problems of Linear Algebra. Schaum's Outline Series, 2000.
Electronic Materials	None
Other Learning Materials	None

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	1.Lecture Room with maximum capacity of 30 students and equipped with White Board, Overhead projector and internet connection. 2.Library
Technology Resources (AV, data show, Smart Board, software, etc.)	Projectors
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	None

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment	Students	Direct and Indirect
Extent of achievement of course learning outcomes	Teachers	Direct
Quality of learning resources	Students	Indirect

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	The Curriculum committee
Reference No.	
Date	25/08/2021

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA
T4
2020

Course Specifications

Course Title:	Mathematics 2
Course Code:	MATH 101
Program:	General course
Department:	Mathematics
College:	Science
Institution:	University of Tabuk

Table of Contents

A. Course Identification

1. Credit hours: **03 Hours/Week**			
2. Course type			
a. University ☐	College √	Department ☐	Others ☐
b. Required √	Elective ☐		
3. Level/year at which this course is offered: **L2/Y1**			
4. Pre-requisites for this course (if any)**: Math100**			
5. Co-requisites for this course (if any)**:** None			

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	45	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	45
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Others** (specify)	
	Total	45

B. Course Objectives and Learning Outcomes

1. Course Description

This course is designed to help students develop calculus skills to a significant depth and prepare them for higher level mathematics courses.

2. Course Main Objective

- Students will be able to identify the role of continuity and differentiability in the treatment of mather problems.
- Students will be able to use of chain rule for finding differentiation of functions.
- Students will be able to apply concepts of differentiations to solve physical problems.

3. Course Learning Outcomes

	CLOs	Aligned-PLOs
1	**Knowledge and Understanding**	
1.1	Define the different types of functions, properties and forms and use it to express some natural phenomena	ILO 1
1.2	Recognize the basic concepts of limits, continuity, differentiation and	ILO 1

CLOs		Aligned-PLOs
	anti-differentiation, and the relationship between them	
1.3	Recognize the basic rules and theories of differentiation	ILO 1
1.4	Define calculus concepts and techniques to provide mathematical models of real-world situations	ILO 1 + 5
2	**Skills:**	
2.1	Apply the rules continuity at a point or on intervals to distinguish between the types of discontinuities at a point	ILO 1
2.2	Compute limits, derivatives, antiderivatives for a various types of functions	ILO 1
2.3	Analyze functions and their graphs as informed by limits and derivatives	ILO 1
2.4	Apply differentiation to solve real world problems such as rate of change and optimization	ILO 1 + 3
3	**Values:**	
3.1	Demonstrate proficiency in communicating calculus concepts.	ILO 5
3.2	Demonstrate proficiency in individual and group work.	ILO 3

C. Course Content

No	List of Topics	Contact Hours
1	Continuity	3 HRS
2	The Intermediate Value Theorem, Definition of the Derivatives	3 HRS
3	Basic Differentiation Rules	3 HRS
4	Derivative of Exponential & Related Functions, Derivative of Trigonometric Functions	3 HRS
5	The Chain Rule, Implicit Differentiation & Higher Derivatives	3 HRS
6	**Mid-Exam 1**	
6	Derivatives of Logarithmic Functions	3 HRS
7	L'H'opital Rule	3 HRS
8	Maximum and Minimum Values, Rolle's Theorem and Mean Value Theorem	3 HRS
9	Maximum and Minimum Values, Rolle's Theorem and Mean Value Theorem	3 HRS
10	Monotonicity and the Derivative Test, Concavity and the 2nd Derivative Test Anti- Derivative, Indefinite Integrals	3 HRS
11	Monotonicity and the Derivative Test, Concavity and the 2nd Derivative Test Anti- Derivative, Indefinite Integrals	3 HRS
11	**Mid-Exam 2**	
12	Integration using Substitution, The Fundamental Theorem of Calculus	3 HRS
13	Integration using Substitution, The Fundamental Theorem of Calculus	3 HRS
14&15	**Revision & Final Exam**	6 HRS
Total		**45 HRS**

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

<table>
<tr><th>Code</th><th>Course Learning Outcomes</th><th>Teaching Strategies</th><th>Assessment Methods</th></tr>
<tr><td>1.0</td><td colspan="3">Knowledge and Understanding</td></tr>
<tr><td>1.1</td><td>Define function with its different types, properties and forms and use it to express some natural phenomena</td><td rowspan="4">• Traditional lectures.
• Group discussions.
• Cooperative learning.
• Self-learning through the website.
.</td><td rowspan="4">• Exams.
• Activities Class.
• Quizzes.
• Assignments.</td></tr>
<tr><td>1.2</td><td>Understand the basic concepts of limits, continuity, differentiation and anti-differentiation, and the relationship between them</td></tr>
<tr><td>1.3</td><td>Know the basic rules and theories of differentiation</td></tr>
<tr><td>1.4</td><td>Identify appropriate calculus concepts and techniques to provide mathematical models of real-world situations</td></tr>
<tr><td>2.0</td><td colspan="3">Skills</td></tr>
<tr><td>2.1</td><td>Determine continuity at a point or on intervals and distinguish between the types of discontinuities at a point</td><td rowspan="4">• Traditional lectures.
• Group discussions.
• Cooperative learning.
• Self-learning through the website.</td><td rowspan="4">• Exams.
• Assignments.
• Quizzes.</td></tr>
<tr><td>2.2</td><td>Compute limits, derivatives, antiderivatives for a various types of functions</td></tr>
<tr><td>2.3</td><td>Analyze functions and their graphs as informed by limits and derivatives</td></tr>
<tr><td>2.4</td><td>Use differentiation to solve real world problems such as rate of change and optimization</td></tr>
<tr><td>3.0</td><td colspan="3">Values</td></tr>
<tr><td>3.1</td><td>Realize the importance of the computational principles of calculus to the solutions of various mathematical problems.</td><td rowspan="2">• Group discussions.
• Cooperative learning.
• Projects.</td><td rowspan="2">• Assignments.
• Class Activities.
Oral exams.</td></tr>
<tr><td>3.2</td><td>Present mathematics clearly and precisely to an audience of peers and faculty.</td></tr>
</table>

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Activities	Weekly basis	5%
2	Home works	Weekly basis	5%
3	Quizzes	Weekly basis	5%
4	Mid Exam-I	6^{th} week	20%
5	Mid Exam-II	11^{th} week	20%
6	Final Exam	At end of the Semester	40%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

Six office hours per week in the lecturer schedule.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Calculus and Introduction to Integrals (Compiled by Dr. Hamed Alsulami and Dr. Saleh Almezel) (2012)
Essential References Materials	Courant, Richard, and Fritz John. Introduction to calculus and analysis I. Springer Science & Business Media, 2012
Electronic Materials	None
Other Learning Materials	None

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	- Lecture Room with maximum capacity of 30 students and equipped with White Board, Overhead projector and internet connection. - Library
Technology Resources (AV, data show, Smart Board, software, etc.)	Projectors
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	None

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment	Students	Direct and Indirect

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Extent of achievement of course learning outcomes	Teachers	Direct
Quality of learning resources	Students	Indirect

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	The Curriculum committee
Reference No.	
Date	25/08/2021

NCAAA T4 2020

Course Specifications

Course Title:	Engineering Mathematics-3
Course Code:	MATH284
Program:	Bachelor of Science in Mathematics
Department:	Mathematics
College:	Faculty of Science
Institution:	University of Tabuk

Table of Contents

A. Course Identification

1. Credit hours:	**03 Hours/Week**		
2. Course type			
a. University ☐	College ☐	Department √	Others ☐
b. Required √	Elective ☐		
3. Level/year at which this course is offered: **L3/Y2**			
4. Pre-requisites for this course (if any): **MATH 101**			
5. Co-requisites for this course (if any)**:** None			

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	45	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	45
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Others** (specify)	
	Total	45

B. Course Objectives and Learning Outcomes

1. Course Description

This course is designed to help students develop calculus skills, where the course help students to master the basic methods of integration and their applications. The course also introduce students to sequences and Infinite Series and their convergence.

2. Course Main Objective

-Students will be able to recall basic rules and theorems of integral calculus.
-Students will be able to apply integration methods to solve geometrical and physical problems .
-Students will be able to analyze the convergence of infinite series.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Students will be able to recall concepts of integration.	K1
1.2	Students will be able to recognize methods of integration in practical problems.	K2
2	**Skills :**	

CLOs		Aligned PLOs
2.1	Students will be able to solve the analytical procedures to solve problems of integration..	S1
2.2	Students will be able to demonstrate integration of functions and their graphs.	S2
2.3	Students will be able to apply the fundamental theorem.	S3
3	**Values:**	
3.1	Students will Demonstrate responsibility to solve given assignments on their own and submit the solution on time.	V2

C. Course Content

No	List of Topics	Contact Hours
1	Indefinite integrals, Integration by substitution.	3 Hrs
2	Definite integral, The fundamental Theorem of calculus.	3 Hrs
3	Definite integral by Substitution	3 Hrs
4	Hyperbolic Functions, Area Between Two Curves.	3 Hrs
5	Volumes By Slicing ; Disks And Washers.	3 Hrs
6	Length of a plane Curve, Area of a Surface of Revolution.	3 Hrs
6	**Mid-Exam 1**	
7	Integration by parts, Trigonometric Integrals.	3 Hrs
8	Improper Integrals.	3 Hrs
9	Sequences , Monotone Sequences.	3 Hrs
10	Infinite Series, Convergence Tests.	3 Hrs
11	The Comparison ,Ratio, and Root tests.	3 Hrs
11	**Mid-Exam 2**	
12	Alternating Series; Conditional convergence	3 Hrs
13,14	Maclurin and Taylor polynomials Maclurin	6 Hrs
15	Maclurin and Taylor series ; power series	3 Hrs
16,18	**Revision & Final Exam**	
Total		**45 Hrs**

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Students will be able to recall concepts of integration.	Introducing new ideas through case study Lectures Class Discussions	Quizzes I II Midterm Exam Final Exam homework assignments
1.2	Students will be able to recognize methods of integration in practical problems.		
…			
2.0	**Skills**		
2.1	Students will be able to solve the analytical procedures to solve problems of integration..	Lectures Class Discussions	QuizzesI II Midterm Exams Final Exams Homework assignments.
2.2	Students will be able to demonstrate integration of functions and their graphs.		
2.3	Students will be able to apply the fundamental theorem.		
2.4	Students will be able to interpret integration of functions and their graphs.		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
3.0	**Values**		
3.1	Students will Demonstrate responsibility to solve given assignments on their own and submit the solution on time	Lectures Assign tasks	Quizzes Homework assignments

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Activities	Weekly basis	5%
2	Homework	Weekly basis	5%
3	Quizzes	Weekly basis	10%
4	Mid Exam	6th week	20%
5	Mid Exam	11th week	20%
6	Final Exam	At end of the Semester	40%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :
Six office hours per week in the lecturer schedule.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	**Calculus, Early Transcendentals ,10th** ed **Author ; Howard Anton, I. Bivins, S. Davis**
Essential References Materials	Courant, Richard, and Fritz John. Introduction to calculus and analysis I. Springer Science & Business Media, 2012.
Electronic Materials	None
Other Learning Materials	None

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	1.Lecture Room with capacity of 30 students and equipped with White Board, Overhead projector and internet connection. 2.Library
Technology Resources (AV, data show, Smart Board, software, etc.)	Projectors
Other Resources (Specify, e.g. if specific laboratory	None

Item	Resources
equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment	Students	Direct and Indirect
Extent of achievement of course learning outcomes	Teachers	Direct
Quality of learning resources	Students	Indirect

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	The Curriculum committee
Reference No.	
Date	20/08/2023

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAA T4 2020

Course Specifications

Course Title:	Differential Equations
Course Code:	MATH383
Program:	Engineering Course
Department:	Mathematics
College:	Faculty of Science
Institution:	University of Tabuk

Table of Contents

A. Course Identification

1. Credit hours: **03 Hours/Week**							
2. Course type							
a.	University	☐	College	☐	Department	√	Others ☐
b.	Required	√	Elective	☐			
3. Level/year at which this course is offered: **L5/Y3**							
4. Pre-requisites for this course (if any)**:**MATH284							
5. Co-requisites for this course (if any)**:** None							

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	45	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	45
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Others** (specify)	
	Total	45

B. Course Objectives and Learning Outcomes

1. Course Description

- The course is designed to study Introduction to differential equations and solutions of differential equations.
- Classification of Differential Equations
- Method for solving first-Order Differential Equations (Linear equations, Separable equations, Exact equations, Homogeneous equations and Applications).
- Second- and Higher-Order Equations
- Homogeneous equations with constant coefficients, Fundamental solutions, Linear independence and Wronskian, Complex roots, Repeated roots, Method of Undetermined coefficients and Variation of parameters
- Nonhomogeneous Second-Order Linear Equations with Constant Coefficients
- Higher-Order Linear Equations with Constant Coefficients, Systems of Linear Differential Equations (Solution of systems of linear equations, Linear independence, eigenvalues and eigenvectors. Fourier Series.

2. Course Main Objective

- To know Student the importance of the differential equations in Physics, Chemistry and Engineering Science.

- To allow the students acquires knowledge by learning new theories, concepts, and methods of solution in differential equations.
- To study Student the linear differential equations of the first order with some applications.
- To learn Student studies the differential equations of higher order and methods of solution.
- To acquire Student cognitive skills through thinking and problem solving.
- To make Student responsible for their own learning through solutions of assignments and time management.

3. Course Learning Outcomes

	CLOs	AlignedPLOs
1	**Knowledge and Understanding**	
1.1	Students will be able to recall the concepts of differential equations.	**K1**
1.2	Students will be able to recognize the importance of differential equations in different fields.	**K2**
2	**Skills :**	
2.1	Students will be able to solve systems of differential equations by different methods.	S1
2.2	Students will be able to demonstrate differential equations by different methods.	S2
2.3	Students will be able to apply basic knowledge of differential equations in solving mathematical problems.	S3
3	**Values:**	
3.1	Students will be able to take responsibility apply different methods and solve independently.	V1

C. Course Content

No	List of Topics	Contact Hours
1	-Introduction to differential equations and solutions of differential equations.	3 Hrs
2	Classification of Differential Equations.	3 Hrs
3	Method for solving first-Order Differential Equations.	3 Hrs
4	Separable Exact Equations.	3 Hrs
5	Method for solving first-Order Differential Equations.	3 Hrs
6	Linear, Bernoulli Equations.	3 Hrs
6	**Mid-Exam1**	
7	Second- and Higher-Order Equations.	3 Hrs
8,9	Homogeneous Linear equations with constant coefficients.	6 Hrs
10	Undetermined coefficients-superposition approach.	3 Hrs
11	Variation of parameters.	3 Hrs
11	**Mid-Exam2**	
12	Cauchy-Euler Equation,Systems of Linear Equations	3 Hrs
13	Systems of Linear First-order Differential Equations.	3 Hrs
14	Distinct real and repeated eigenvalues, Variation of Parameters.	3 Hrs
15	Orthogonal Functions Fourier Series, Fourier Cosine and Sine Series.	3 Hrs
16,18	**Revision & Final Exam**	
	Total	**45 Hrs**

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	TeachingStrategies	AssessmentMethods
1.0	**Knowledge and Understanding**		
1.1	Students will be able to recall the concepts of differential equations.	Introducing new ideas through case study Lectures Class Discussions	- Quizzes -Assignments -Midterm exams - Final exam
1.2	Students will be able to recognize the importance of differential equations in different fields.		
2.0	**Skills**		
2.1	Students will be able to solve systems of differential equations by different methods.	Lectures Class Discussions	- Quizzes -Assignments -Midterm exams - Final exam
2.2	Students will be able to demonstrate differential equations by different methods.		
2.3	Students will be able to apply basic knowledge of differential equations in solving mathematical problems.		
3.0	**Values**		
3.1	Students will be able to take responsibility for working independently	- Lectures -Assign tasks	- Quizzes -Assignments

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Activities	Weekly basis	5%
2	Homework	Weekly basis	5%
3	Quizzes	Weekly basis	10%
4	Mid Exam	6th week	20%
5	Mid Exam	11th week	20%
6	Final Exam	At end of the Semester	40%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice : * Six office hours per week in the schedule.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	**Differential Equations with Boundary-Value Problems. 4th Edition** by Dennis G. Zill and Michael R. Cullen

Essential References Materials	-Shepley L. Ross: Differential Equations:3rd. Edit. (1998): John Wiley & Sons. , Inc. -Elementary Differential Equations 6th ed. (1981) Author; Earl D. Rainsville and Phillipe E. Bedient
Electronic Materials	None
Other Learning Materials	None

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	- Lecture Room with capacity of 30 students and equipped with White Board, Overhead projector and internet connection. - Library
Technology Resources (AV, data show, Smart Board, software, etc.)	Projectors
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	None

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment	Students	Direct and Indirect
Extent of achievement of course learning outcomes	Teachers	Direct
Quality of learning resources	Students	Indirect

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes,Quality oflearning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods(Direct, Indirect)

H. Specification Approval Data

Council / Committee	The Curriculum committee
Reference No.	
Date	20/08/2023

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

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Course Specifications

Course Title:	**Engineering Materials**
Course Code:	**ME201**
Program:	**Bachelor of Science in Mechanical Engineering**
Department:	**Mechanical Engineering**
College:	**Faculty of Engineering**
Institution:	**Tabuk University**

Table of Contents

A. Course Identification

1. Credit hours:3			
2. Course type			
a. University ☐	College ☐	Department ☒	Others ☐
b. Required ☒	Elective ☐		
3. Level/year at which this course is offered: 5/3			
4. Pre-requisites for this course (if any)**:** **CHEM 101**			
5. Co-requisites for this course (if any)**:**			

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	30
3	Tutorial	
4	**Others** (specify)	
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

Introduction and classification of materials, Modern Material needs, Mechanical behaviors and testing of materials, atomic structure, Atomic Bonding in solids; the structure of crystalline solids, properties and performance, Crystalline and non-crystalline materials, Imperfections in solids; Reaction rates and diffusion. Phase transformations in metals; Mechanical properties of metals; Phase diagrams; Carbon-iron phase diagrams.

2. Course Main Objective

The objective of this course is to provide students with a fundamental understanding of properties of materials and to apply those fundamentals for selecting and developing materials for different engineering applications.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Explain the classes of materials, crystalline, and noncrystalline structures.	K1
1.2	Demonstrate knowledge of atomic structure, Interatomic bonding, crystal defects, and materials diffusions	K1
1.3	Demonstrate knowledge of Phase diagrams and heat treatment.	K1
1...		
2	**Skills :**	
2.1	Calculate the engineering stress, strain, creep, hardness, and failure.	S1
2.2	Conduct mechanical properties experiments	S3
2.3		
2.4		
2.5		
2.6		
2.7		
3	**Values:**	
3.1		
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to Materials Science	2
2.	Mechanical properties of metals	2
3.	Mechanical properties of polymers, composites	2
4.	Failure, fatigue, creep, impact test	2
5.	Atomic Structure & Interatomic Bonding	2
6.	Atomic Structure & Interatomic Bonding	2
7.	The Structure of Crystalline Solids	2
8.	Crystallographic points, directions, and planes	2
9.	Crystalline and non-crystalline materials	2
10.	Imperfections in Crystals	2
11.	Diffusion in solids	2
12.	Dislocations & Strengthening Mechanisms	2
13.	Phase diagram: definitions and basic concepts	2
14.	Phase diagram: binary phase	2
15.	Heat treatments of metals	2
Total		60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Explain the classes of materials, crystalline, and noncrystalline structures.	Lecture	• Classwork • 1st Midterm Exams • 2nd Midterm Exams • Final Exam:
1.2	Demonstrate knowledge of atomic structure, Interatomic bonding, crystal defects, and materials diffusions		
1.3	Demonstrate knowledge of Phase diagrams and heat treatment.		
2.0	**Skills**		
2.1	Calculate the engineering stress, strain, creep, hardness, and failure.	Lecture, Problem based learning	• Classwork • 1st Midterm Exams • 2nd Midterm Exams • Final Exam:
2.2	Conduct mechanical properties experiments	Experimental based learning	• Lab Report & exam
2.3			
3.0	**Values**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Classwork	2 to 14	15
2	1st Midterm Exams	6	15
3	2nd Midterm Exams	11	15
4	Lab Report & exam	2-14	15
5	Final Exam:	Last week	40
6			
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

The Mechanical Engineering Program (MEP) prioritizes the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP

students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Material Science and Engineering-An Introduction, William D. Callister, Jr., Wiley 5th, 6th and 7th.
Essential References Materials	*Physical Metallurgy principles*, R. Abbaschian, L. Abbaschian and R.E. Reed-Hill. Cengage Learning, 4th
Electronic Materials	1. Lecture handouts and presentation on blackboard (https://tabuk.blackboard.com/webapps/login/?action=relogin) 2. Interactive Simulations: • PhET Interactive Simulations (https://phet.colorado.edu/) 3. Online Courses and Lectures: • Coursera (https://www.coursera.org/) • edX (https://www.edx.org/) • Khan Academy (https://www.khanacademy.org/) **4. Educational YouTube Channels:** • LearnEngineering (https://www.youtube.com/user/LearnEngineering) **Engineering Journals and Databases:** • ASME: The American Society of Mechanical Engineers (https://www.asme.org/) • ScienceDirect (https://www.sciencedirect.com/) **5. Virtual Labs:** • Virtual Lab (http://www.vlab.co.in/) 6. **Engineering Software:** • AutoCAD (https://www.autodesk.com/products/autocad/overview) • SolidWorks (https://www.solidworks.com/) • Fusion 360 (https://www.autodesk.com/products/fusion-360/overview) • MATLAB (https://www.mathworks.com/products/matlab.html) • Python (https://www.python.org/) 7. **Mechanical Engineering Apps:** • Engineering Toolbox (https://www.engineeringtoolbox.com/) • Wolfram Alpha (https://www.wolframalpha.com/) 8. **Discussion Forums:** • Engineering Stack Exchange (https://engineering.stackexchange.com/) • Reddit - Mechanical Engineering (https://www.reddit.com/r/MechanicalEngineering/) 9. **Webinars and Conferences:**

	ASME Events (https://www.asme.org/events)
Other Learning Materials	1. **Lecture Notes and Tutorials:** • MIT OpenCourseWare (https://ocw.mit.edu/index.htm) • LectureNotes (https://lecturenotes.in/) 2. **Technical Blogs and Articles:** • Mechanical Engineering Blog (https://www.engineeringchoice.com/mechanical-engineering-blog/) • ASME's Mechanical Engineering Magazine (https://www.asme.org/topics-resources/society-news/asme-magazine) 3. **Industry Reports and Trends:** • McKinsey & Company - Mechanical Engineering (https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights) • Frost & Sullivan - Mechanical Engineering (https://ww2.frost.com/research/industry/mechanical-electrical/) 4. **Professional Organizations:** • Institution of Mechanical Engineers (IMechE) (https://www.imeche.org/) 5. **Technical Magazines:** • Mechanical Engineering Magazine (https://www.memagazine.org/) • Machine Design Magazine (https://www.machinedesign.com/) 6. **Interactive Learning Platforms:** • Chegg Study (https://www.chegg.com/study) • Quizlet (thttps://quizlet.com/)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms equipped with data show. White Board.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Mechanics of materials and engineering materials lab.

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

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Education & Training Evaluation Commission

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Course Specifications

Course Title:	Manufacturing Processes
Course Code:	ME202
Program:	Bachelor of Science in Mechanical Engineering
Department:	Mechanical Engineering
College:	College of Engineering
Institution:	Faculty of Engineering

Table of Contents

A. Course Identification

1. Credit hours: 3								
2. Course type								
a.	University	☐	College	☐	Department	■	Others	☐
b.	Required	■	Elective	☐				
3. Level/year at which this course is offered: 6/ 3								
4. Pre-requisites for this course (if any)**:** **ENG 202 and ME 201**								
5. Co-requisites for this course (if any)**:** **N.A**								

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	60	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	30
3	**Tutorial**	
4	**Others** (specify)	
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

Engineering Materials, Manufacturing properties of materials, Testing, Metal and Alloys, Non-metal materials - Elements of Manufacturing Processes, material flow, energy flow and information flow- Forming in the liquid state, Casting and molding processes- forming in the solid state, metal forming, forming of plastics and powder metallurgy- Sheet metal processes (formability of sheets and sheet forming processes, processing of polymers). Material Joining processes, welding processes, soldering and brazing, riveting, testing of weld-ability, joining by mechanical elements, assembly processes- Material removal processes, metal cutting and finishing processes, Gear cutting. Basic machining processes and machine tools - Turning, Drilling, Shaping-and planning, Milling, Grinding, Machining time, Measurements, Basics of CNC machining and programming. Machinability and cutting fluids.

2. Course Main Objective

Upon completion of this course, students will successfully:

- Exemplify the importance of design for manufacture and the role of process selection in new product development process.
- Recognize the classification of manufacturing processes and the main characteristics of each process category.
- Analyse the technical and quality issues of major manufacturing processes.
- Select appropriate manufacturing processes for specific products in terms of technological feasibility and costing.
- Recognize the limitations of major manufacturing processes.
-

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Recall materials behavior, manufacturing properties of engineering materials and materials testing.	K1
1.2	Explain the machining processes.	K1
1.3	Describe joining Processes.	K1
1...		
2	**Skills :**	
2.1	Calculate the engineering stress, strain, creep, and hardness.	S1
2.2		
2.3		
2.4		
3	**Values:**	
3.1		
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Chap 1: Fundamentals of Materials Their Behaviour and Manufacturing Properties.	10
2	Chap 2: Metal-Casting Processes and Equipment	10
3	Chap 3: Forming and Shaping Processes and Equipment	10
4	Chap 4: Machining Processes and Machine Tools	15
5	Chap 5: Joining Processes and Equipment	15
6		

7		
	Total	60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Recall materials behavior, manufacturing properties of engineering materials and materials testing.	Lecture	• Classwork • 1st Midterm Exams
1.2	Explain the machining processes.	Lecture	• Classwork • 1st Midterm Exams • 2nd Midterm Exams Final Exam
1.3	Describe joining and welding Processes.	Lecture	• Classwork Final Exam
2.0	**Skills**		
2.1	Calculate the engineering stress, strain, creep, and hardness.	Lecture, Problem based learning	• Classwork • 1st Midterm Exams • 2nd Midterm Exams Final Exam
2.2			
2.3			
2.4			
3.0	**Values**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Classwork	2 to 15	15 %
2	Mid-term (1)	8	15 %
3	Mid-term (2)	12	15 %
4	Workshop Report	2 to 12	15 %
5	Final Exam	Last week	40 %
6			
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

The Mechanical Engineering Program (MEP) prioritize the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a

supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	- Serope Kalpakjian, "Manufacturing Processes for Engineering Materials," Fourth Edition, Addison Wesley, 2002
Essential References Materials	- Handouts: Prepared by the instructor - Mikell Groover, "Fundamentals of Modern Manufacturing," Second Edition, John Wiley & Sons, 2003
Electronic Materials	Electronic Materials available in Blackboard **1. Educational YouTube Channels:** ● LearnEngineering (https://www.youtube.com/user/LearnEngineering) **Engineering Journals and Databases:** ● ASME: The American Society of Mechanical Engineers (https://www.asme.org/) ● ScienceDirect (https://www.sciencedirect.com/) **2. Virtual Labs:** ● Virtual Lab (http://www.vlab.co.in/) 3. **Engineering Software:** • AutoCAD (https://www.autodesk.com/products/autocad/overview)
Other Learning Materials	• ASME's Mechanical Engineering Magazine (https://www.asme.org/topics-resources/society-news/asme-magazine) 1. **Industry Reports and Trends:** • McKinsey & Company - Mechanical Engineering (https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights) • Frost & Sullivan - Mechanical Engineering (https://ww2.frost.com/research/industry/mechanical-electrical/) 2. **Professional Organizations:** • Institution of Mechanical Engineers (IMechE) (https://www.imeche.org/) 3. **Technical Magazines:**

	• Mechanical Engineering Magazine (https://www.memagazine.org/) • Machine Design Magazine (https://www.machinedesign.com/) 4. **Interactive Learning Platforms:** • Chegg Study (https://www.chegg.com/study) • Quizlet (thttps://quizlet.com/)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms equipped with data show. White Board
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Manufacturing workshop, testing equipment and machines

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

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Course Specifications

Course Title:	**Mechanical Drawing and Graphics**
Course Code:	**ME211**
Program:	**Bachelor of Science in Mechanical Engineering**
Department:	**Mechanical Engineering**
College:	**College of Engineering**
Institution:	**University of Tabuk**

Table of Contents

A. Course Identification

1. Credit hours:3								
2. Course type								
a.	University	☐	College	☐	Department	■	Others	☐
b.	Required	■	Elective	☐				
3. Level/year at which this course is offered: 5/3								
4. Pre-requisites for this course (if any)**:** ENG 201								
5. Co-requisites for this course (if any)**:** **N.A**								

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	75	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	15
2	**Laboratory/Studio**	60
3	**Tutorial**	
4	**Others** (specify)	
	Total	75

B. Course Objectives and Learning Outcomes

1. Course Description

This course explores the Auxiliary views; Skew and inclined planes; Surface intersections; Developed views; Fits and tolerances; surface finish notations; Fasteners; rivets, welds, pins, keys, bolts, nuts. Standard representation and drawing of common mechanical elements; Machine components; Structural drawings; Assembly and working drawings; Fundamentals of computer graphics and the use of Auto CAD computer drafting software.

2. Course Main Objective

The main objectives of the course include:

- Apply the main assembly instructions on some important exercises.
- Distinguish and generate the different types of drawings: Working drawings and assembly drawings.

- Know the different surface finish notations.
- Know the different type of fits and tolerance.
- Know how to use and draw some standard parts as bolts and nuts.
- Understand the basic techniques for assembly of machine parts.
- Distinguish between the data and instructions used for both working and assembly drawings.
- Motivate the intellectual abilities to imagine and deduce machine parts and a whole machine from the drawings views.
- Motivate the imagination for producing new ideas and methods in machine drawings.
- Practice the standard drawing methods to generate both working and assembly mechanical drawings.
- Write and specify correctly and according to standards the instructions, machining marks, and the dimensions on mechanical drawings.
- Use the up-to-date facilities such as computer graphics and the use of CAD computer drafting software.

These objectives aim to provide students with a comprehensive understanding of mechanical drawings.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Recall the different type of fits, tolerance and surface finish notations.	K1
1.2		
1.3		
1...		
2	**Skills :**	
2.1	Sketch views different types of drawings: Working drawings and assembly drawings	S1
2.2	Use some standard parts as keys, bolts, nuts, pins, welds, etc	S1
2.3	Sketch the standard drawing methods to draw common mechanical elements, machine components.	S1
2.4	Use the up to date facilities to develop mechanical drawings.	S1
3	**Values:**	
3.1		
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Conventional lettering and dimensioning	5
2	The Auxiliary views; Skew and inclined planes; Surface intersections; Developed views	10
3	The basic methods for assembly drawings.	15
4	Fits and tolerances; surface finish notations	5
5	Standard representation of common mechanical elements (Fasteners; rivets, welds, pins, keys, bolts, nuts)	10

6	Generating the working and assembly drawings. (Exercises in assembly of small-scale mechanical units)	20
7	Use of CAD computer drafting software	10
Total		75

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Recall the different type of fits, tolerance and surface finish notations.	Lecture	Midterm Exams Final Exam
1.2			
…			
2.0	**Skills**		
2.1	Sketch views different types of drawings: Working drawings and assembly drawings	Lecture Problem based learning	• Classwork • Midterm Exams Final Exam:
2.2	Use some standard parts as keys, bolts, nuts, pins, welds, etc.	Lecture Problem based learning	• Classwork • Midterm Exams Final Exam:
2.3	Sketch the standard drawing methods to draw common mechanical elements, machine components.	Lecture Problem based learning	• Classwork • Midterm Exams Final Exam:
2.4	Use the up to date facilities to develop mechanical drawings.	Lecture Problem based learning in CAD drawings	Classwork
3.0	**Values**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Class works	2 to 15	30 %
2	Mid-term (1)	8	15 %
3	Mid-term (2)	10-12	15 %
4	Final Exam	Last week	40 %
5			
6			
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

The instructor is always available for individual student advising on lecture time and during the office hours.
The Mechanical Engineering Program (MEP) prioritize the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	• Interpreting engineering Drawings, 8th. Edition, Theodore J. Branoff, Cengage Learning, 2014. • Manual of Engineering Drawing, 2nd. Edition, Colin H Simmons, Dennis E Maguire, Elsevier Newnes, 2004.
Essential References Materials	• Handouts: Prepared by the instructor • James D. Bethune "Engineering Graphics with AUTOCAD 2008", Prentice Hall, 2008. • Alex Krulikowski, Delmar Learning, Fundamentals of Geometric Dimensioning and Tolerancing, 2nd. Edition, 1997. • Thomas E. French, et al, Engineering Drawing and Graphic Technology, 14th. Edition, 1993.
Electronic Materials	Electronic Materials available in Blackboard **Educational YouTube Channels:** • LearnEngineering (https://www.youtube.com/user/LearnEngineering) **Engineering Journals and Databases:** • ASME: The American Society of Mechanical Engineers (https://www.asme.org/) • ScienceDirect (https://www.sciencedirect.com/) **Engineering Software:** • AutoCAD (https://www.autodesk.com/products/autocad/overview)

Other Learning Materials	CAD software such as AutoCAD and LibreCAD **Lecture Notes and Tutorials:** • MIT OpenCourseWare (https://ocw.mit.edu/index.htm) • LectureNotes (https://lecturenotes.in/) **Technical Blogs and Articles:** • Mechanical Engineering Blog (https://www.engineeringchoice.com/mechanical-engineering-blog/)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Classrooms equipped with data show. • White Board. • Mechanical Design Software lab.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	N/A

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA
T4
2020

Course Specifications

Course Title:	**Mechanics of machines**
Course Code:	**ME212**
Program:	**Bachelor of Science in Mechanical Engineering**
Department:	**Mechanical Engineering**
College:	**Faculty of engineering**
Institution:	**Tabuk university**

Table of Contents

A. Course Identification

1. Credit hours: 3	
2. Course type	
a. University ☐ College ☐ Department ☒ Others ☐	
b. Required ☒ Elective ☐	
3. Level/year at which this course is offered: **6/3**	
4. Pre-requisites for this course (if any)**:** **ENG 204 , ME 211**	
5. Co-requisites for this course (if any)**:** **None**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	60	100 %
2	**Blended**	0	0
3	**E-learning**	0	0
4	**Distance learning**	0	0
5	**Lab**	60	100 %

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	30
3	**Tutorial**	0
4	**Others** (specify)	0
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

Kinematics Fundamentals : Geometry of Motion and Mechanism Topology, Linkage Mechanisms and Planar Robots : Position; Displacement; Velocity; and Acceleration (Graphical, Analytical and Computers Assisted Methods), Cam - Follower Mechanisms : Design and Analysis (Graphical, Analytical and Computers Assisted Methods); standard Cams and Equivalent Mechanisms, Kinematics of Gear Trains: Gears Terminology; Simple, Compound, and planetary Gear Trains, Dynamics Fundamentals; Force Analysis of Mechanisms; Basics of rotating and reciprocating Balancing; Machines(gyroscope, governor, belt, brake, clutch, etc.), Applications and Use of Computers for Mechanism Simulation and Animation, Course project.

2. Course Main Objective

The main purpose for this course is to make students able to:

- Know the components of a mechanism.
- Calculate the number of degrees of freedom.

- Determine the mechanism extreme positions.
- Calculate the linear and angular velocity of any part of the mechanism.
- Calculate the linear and angular acceleration of any part of the mechanism.
- Determine the link member in any mechanism.
- Calculate the internal forces acting on any link.
- Determine the required power to drive any mechanism.
- Differentiate between different types of gears.
- Calculate the speed ratios for different gear trains.
- Differentiate between different types of cams.
- Select the suitable cam type for different applications.
- Make the required calculations for balancing of rotating masses.

Make the required calculations for balancing of reciprocating masses.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	NA	NA
1.2		
1.3		
1...		
2	**Skills :**	
2.1	Calculate Degrees of Freedom and Extreme Positions	S1
2.2	Solve Velocity and Acceleration in Mechanisms	S1
2.3	Apply Force Analysis on Mechanisms	S1
2.4	Solve Cam-Follower problems	S1
2.5	Solve Gear Trains problems	S1
2.6	Solve Out of balance problems	S1
2.7	Conduct Experiments (Lab Work)	S3
3	**Values:**	
3.1	NA	NA
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Mechanism and machines	8
2	Velocity analysis	12
3	Acceleration analysis	8
4	Static and dynamic analysis	8
5	Cams	8
6	Gears	8
7	Balancing	8
	Total	60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	NA	NA	NA
1.2			
1.3			
2.0	**Skills**		
2.1	Calculate Degrees of Freedom and Extreme Positions	Lecture	• • 1st Midterm Exams • 2nd Midterm Exams Final Exam:
2.2	Solve Velocity and Acceleration in Mechanisms		
2.3	Apply Force Analysis on Mechanisms		
2.4	Solve Cam-Follower problems		
2.5	Solve Gear Trains problems		
2.6	Solve Out of balance problems		
2.7	Conduct Experiments (Lab Work)	Experimental based learning	• Lab Report & exam
3.0	**Values**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Classwork	Weekly	15
2	1st Midterm Exams	6	15
3	2nd Midterm Exams	11	15
4	Lab Report & exam	2-14	15
5	Final Exam:	Last week	40
6			
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

The Mechanical Engineering Program (MEP) prioritize the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels,

including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Rattan S.S, "Theory of Machines" Tata McGraw-Hill Publishing Company Ltd., New Delhi and 2nd. Ed. 2005.
Essential References Materials	Sadhu Singh, "Theory of Machines," Pearson Education (Singapore) Pvt. Ltd., Indian Branch, New Delhi, 2nd. Ed. 2006. - Design of Machinery, 3rd. Edition, Robert L. Norton, McGraw-Hill, 2004. - Hannah, J., Mechanics of Machines, British Library, 1984. - Mobie, H. H., Mechanics and Dynamics of Machinery, John Wiley and Sons, 1987.
Electronic Materials	1. Lecture handouts and presentation on blackboard (https://tabuk.blackboard.com/webapps/login/?action=relogin) 2. Interactive Simulations: ● PhET Interactive Simulations (https://phet.colorado.edu/) 3. Online Courses and Lectures: ● Coursera (https://www.coursera.org/) ● edX (https://www.edx.org/) ● Khan Academy (https://www.khanacademy.org/) **4. Educational YouTube Channels:** ● LearnEngineering (https://www.youtube.com/user/LearnEngineering) **Engineering Journals and Databases:** ● ASME: The American Society of Mechanical Engineers (https://www.asme.org/) ● ScienceDirect (https://www.sciencedirect.com/) **5. Virtual Labs:** ● Virtual Lab (http://www.vlab.co.in/) 6. **Engineering Software:** ● AutoCAD (https://www.autodesk.com/products/autocad/overview) ● SolidWorks (https://www.solidworks.com/) ● Fusion 360 (https://www.autodesk.com/products/fusion-360/overview) ● MATLAB (https://www.mathworks.com/products/matlab.html) ● Python (https://www.python.org/) 7. **Mechanical Engineering Apps:** ● Engineering Toolbox (https://www.engineeringtoolbox.com/) ● Wolfram Alpha (https://www.wolframalpha.com/) 8. **Discussion Forums:** ● Engineering Stack Exchange (https://engineering.stackexchange.com/)

	• Reddit - Mechanical Engineering (https://www.reddit.com/r/MechanicalEngineering/) 9. **Webinars and Conferences:** ASME Events (https://www.asme.org/events)
Other Learning Materials	YouTube learning videos. 1. **Professional Organizations:** • Institution of Mechanical Engineers (IMechE) (https://www.imeche.org/) 2. **Technical Magazines:** • Mechanical Engineering Magazine (https://www.memagazine.org/) • Machine Design Magazine (https://www.machinedesign.com/) 3. **Interactive Learning Platforms:** • Chegg Study (https://www.chegg.com/study) • Quizlet (thttps://quizlet.com/)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms equipped with data show. White Board.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Mechanics of machines lab

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA
T4
2020

Course Specifications

Course Title:	**Mechanics of Materials**
Course Code:	**ME213**
Program:	**Bachelor of Science in Mechanical Engineering**
Department:	**Mechanical Engineering**
College:	**Faculty Engineering**
Institution:	**Tabuk University**

Table of Contents

A. Course Identification

1. **Credit hours:** 3	
2. Course type	
a. University ☐ College ☐ Department ☒ Others ☐	
b. Required ☒ Elective ☐	
3. **Level/year at which this course is offered:** 6/3	
4. **Pre-requisites for this course** (if any): Eng203	
5. **Co-requisites for this course** (if any):	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	60	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	30
3	**Tutorial**	
4	**Others** (specify)	
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

The Machine Types of loads, structures and supports, axial stress and strain, normal and bending moment diagrams, torsion, bending of beams, combined stresses, shearing stress and strain, Mohr's circle of stress and strain, thin walled pressure vessels, deflection of simple beams, buckling of columns.

2. Course Main Objective

- Recognize the different types of loading and their effects on the mechanical systems (axial loading, transverse loading, bending moments, torsion torques).
- Know the definitions of normal stress, normal strain, shear stress, shear strain,etc.
- Analyze the stress and strain in order to design mechanical system that can withstand a given set of loading.
- Recognize the different types of deformations and study their relations to stress and strain.
- Be able to analyze statically determinate and statically indeterminate structures under different types of loading (axial loading, torsional torque and transverse loading).
- Construct shear and bending moment diagrams for beams and analyze the resulted stresses.

• Be familiar with the stress transformations and Mohr's circle and find the principal stresses and the maximum shear stress.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Recall the various regions & points on stress-strain diagram.	K1
2	**Skills :**	
2.1	Solve average normal and average shear stress-strain problems.	S1
2.2	Solve torsion problems	S1
2.3	Solve bending problems.	S1
2.4	Solve transverse shear stress problems.	S1
2.5	Sketch Mohr's circle and solve stress transformation problems.	S1
2.6	Solve deflection of beams & shafts problems.	S1
2.7	Conduct material's mechanical properties experiments.	S3
3	**Values:**	
3.1		
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to Mechanics of Materials	4
2.	Types of Loads and Stresses	4
3.	Axial Loads and Stress Analysis	4
4.	Shear Forces and Bending Moments	4
5.	Stress-Strain Relationships	4
6.	Statically Determinate and Indeterminate Structures	4
7.	Thermal Stresses and Strain	4
8.	Shear Stress and Bending Stress Distribution	4
9.	Analysis of Beams: Deflection and Slope	4
10.	Torsion in Circular Shafts	4
11.	Combined Loading and Principal Stresses	4
12.	Mohr's Circle for Stress Analysis	4
13.	Thin-Walled Pressure Vessels	4
14.	Yield Criteria and Safety Factors	4
15.	Laboratory Practices in Mechanics of Materials	4

Total	
	60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Recall the various regions & points on stress-strain diagram.	Lecture	• Classwork • 1st Midterm Exams • 2nd Midterm Exams • Final Exam:
2.0	**Skills**		
2.1	Solve average normal and average shear stress-strain problems.	Lecture, Problem based learning	• Classwork • 1st Midterm Exams • 2nd Midterm Exams • Final Exam:
2.2	Solve torsion problems		
2.3	Solve bending problems.		
2.4	Solve transverse shear stress problems.		
2.5	Sketch Mohr's circle and solve stress transformation problems.		
2.6	Solve deflection of beams & shafts problems.		
2.7	Conduct material's mechanical properties experiments.	Experimental based learning	• Lab Report & exam
3.0	**Values**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Classwork	2 to 14	15
2	1st Midterm Exams	6	15
4	2nd Midterm Exams	11	15
5	Lab Report & exam	2-14	15
6	Final Exam:	Last week	40
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice : The Mechanical Engineering Program (MEP) prioritize the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual

consultations and academic advice. MEP faculty members are dedicated to fostering a supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Mechanics of Materials, F. P. Beer et al, Sixth edition, Mc Graw Hill.
Essential References Materials	Mechanics of Materials, F. P. Beer et al, Sixth edition, Mc Graw Hill.
Electronic Materials	1. Lecture handouts and presentation on blackboard (https://tabuk.blackboard.com/webapps/login/?action=relogin) 2. Interactive Simulations: ● PhET Interactive Simulations (https://phet.colorado.edu/) 3. Online Courses and Lectures: ● Coursera (https://www.coursera.org/) ● edX (https://www.edx.org/) ● Khan Academy (https://www.khanacademy.org/) **4. Educational YouTube Channels:** ● LearnEngineering (https://www.youtube.com/user/LearnEngineering) **Engineering Journals and Databases:** ● ASME: The American Society of Mechanical Engineers (https://www.asme.org/) ● ScienceDirect (https://www.sciencedirect.com/) **5. Virtual Labs:** ● Virtual Lab (http://www.vlab.co.in/) 6. **Engineering Software:** ● AutoCAD (https://www.autodesk.com/products/autocad/overview) ● SolidWorks (https://www.solidworks.com/) ● Fusion 360 (https://www.autodesk.com/products/fusion-360/overview) ● MATLAB (https://www.mathworks.com/products/matlab.html) ● Python (https://www.python.org/) 7. **Mechanical Engineering Apps:** ● Engineering Toolbox (https://www.engineeringtoolbox.com/) ● Wolfram Alpha (https://www.wolframalpha.com/)

	8. **Discussion Forums:** • Engineering Stack Exchange (https://engineering.stackexchange.com/) • Reddit - Mechanical Engineering (https://www.reddit.com/r/MechanicalEngineering/) 9. **Webinars and Conferences:** ASME Events (https://www.asme.org/events)
Other Learning Materials	1. **Lecture Notes and Tutorials:** • MIT OpenCourseWare (https://ocw.mit.edu/index.htm) • LectureNotes (https://lecturenotes.in/) 2. **Technical Blogs and Articles:** • Mechanical Engineering Blog (https://www.engineeringchoice.com/mechanical-engineering-blog/) • ASME's Mechanical Engineering Magazine (https://www.asme.org/topics-resources/society-news/asme-magazine) 3. **Industry Reports and Trends:** • McKinsey & Company - Mechanical Engineering (https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights) • Frost & Sullivan - Mechanical Engineering (https://ww2.frost.com/research/industry/mechanical-electrical/) 4. **Professional Organizations:** • Institution of Mechanical Engineers (IMechE) (https://www.imeche.org/) 5. **Technical Magazines:** • Mechanical Engineering Magazine (https://www.memagazine.org/) • Machine Design Magazine (https://www.machinedesign.com/) 6. **Interactive Learning Platforms:** • Chegg Study (https://www.chegg.com/study) • Quizlet (thttps://quizlet.com/)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms equipped with data show. White Board.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Mechanics of materials and engineering materials lab.

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

Course Specifications

Course Title:	**Thermodynamics 1**
Course Code:	**ME221**
Program:	**Bachelor of Science in Mechanical Engineering**
Department:	**Mechanical Engineering**
College:	**Faculty of Engineering**
Institution:	**University of Tabuk**

Table of Contents

A. Course Identification

1. Credit hours: 3			
2. Course type			
a. University ☐	College ☐	Department ☒	Others ☐
b. Required ☒	Elective ☐		
3. Level/year at which this course is offered: 5/3			
4. Pre-requisites for this course (if any)**:** MATH 284-PHYS 205			
5. Co-requisites for this course (if any)**:**			

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	60	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	30
3	**Tutorial**	
4	**Others** (specify)	
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

Basic Concepts and Definitions of Thermodynamics: Thermodynamic systems, property, state, process, cycle and equilibrium. Energy and the first law of thermodynamics: Energy balance for closed systems, energy analysis for cycles. Properties of pure substances, Control volume energy analysis. Second law of thermodynamics: statements of second law, Carnot cycle. Maximum performance measures for power, refrigeration and heat pump cycles operating between two reservoirs.

2. Course Main Objective

- Understand the basic concepts and definitions of thermodynamics: thermodynamic systems, property, state, process, cycle and equilibrium and energy and the first law of thermodynamics
- Apply the first law of thermodynamics: energy balance for closed systems, energy analysis for cycles. And control volume energy analysis.
- Demonstrate the knowledge of the properties of pure substances.

- Memorize the second law of thermodynamics and it different statements
- Apply the second law of thermodynamics on Carnot cycle, maximum performance measures for power, refrigeration and heat pump cycles operating between two reservoirs.
- Conduct experimentation to investigate the first and second law of thermodynamics

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Understand the basic concepts and definitions of thermodynamics: thermodynamic systems, property, state, process, cycle and equilibrium and energy and the first law of thermodynamics	K1
1.2	Demonstrate the knowledge of the properties of pure substances.	K1
1.3	Memorize the second law of thermodynamics and it different statements	K1
1...		
2	**Skills :**	
2.1	Apply the first law of thermodynamics: energy balance for closed systems, energy analysis for cycles. And control volume energy analysis.	S1
2.2	Apply the second law of thermodynamics on Carnot cycle, maximum performance measures for power, refrigeration and heat pump cycles operating between two reservoirs.	S1
2.3	Conduct experimentation to investigate the first and second law of thermodynamics	S3
2...		
3	**Values:**	
3.1		
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1.	Understand the basic concepts and definitions of thermodynamics: thermodynamic systems, property, state, process, cycle and equilibrium and energy and the first law of thermodynamics	4
2.	Review concepts of temperature, temperature scales, pressure, and absolute and gage pressure and review the metric SI and the English unit systems.	4
3.	Introduce the concept of energy and define its various forms.	4
4.	Introduce the first law of thermodynamics, energy balances, and	4
5.	mechanisms of energy transfer to or from a system.	4
6.	Discuss the physics of phase-change processes.	4
7.	Demonstrate the procedures for determining thermodynamic properties of pure substances from tables of property data.	4
8.	Apply the ideal-gas equation of state in the solution of typical problems.	4
9.	Examine the moving boundary work or P dV work commonly encountered in reciprocating devices such as automotive engines and compressors.	4

10.	Develop the general energy balance applied to closed systems.	
11.	Solve energy balance problems for closed (fixed mass) systems that involve heat and work interactions for general pure substances, ideal gases, and incompressible substances.	4
12.	Apply the conservation of mass principle to various systems including steady flow control volumes.	4
13.	Solve energy balance problems for common steady-flow devices such as nozzles, compressors, turbines, throttling valves, and mixing chambers.	4
14.	Introduce the second law of thermodynamics.	4
15.	Apply the second law of thermodynamics to cycles and cyclic devices.	4
Total		60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Understand the basic concepts and definitions of thermodynamics: thermodynamic systems, property, state, process, cycle and equilibrium and energy and the first law of thermodynamics	Lecture	• Classwork • 1st Midterm Exams • 2nd Midterm Exams • Final Exam:
1.2	Demonstrate the knowledge of the properties of pure substances.		
1.3	Memorize the second law of thermodynamics and it different statements		
2.0	**Skills**		
2.1	Apply the first law of thermodynamics: energy balance for closed systems, energy analysis for cycles. And control volume energy analysis.	Lecture, Problem based learning	• Classwork • 1st Midterm Exams • 2nd Midterm Exams • Final Exam:
2.2	Apply the second law of thermodynamics on Carnot cycle, maximum performance measures for power, refrigeration and heat pump cycles operating between two reservoirs.		
2.3	Conduct experimentation to investigate the first and second law of thermodynamics	Experimental based learning	• Lab Report & exam
3.0	**Values**		
3.1			
3.2			

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Classwork	2 to 14	15
2	1st Midterm Exams	6	15
3	2nd Midterm Exams	11	15
4	Lab Report & exam	2-14	15
5	Final Exam:	Last week	40
6			
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

The Mechanical Engineering Program (MEP) prioritize the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Thermodynamics An Engineering Approach, Y. A. Cenegl and Michael Boles, McGraw Hill, 7th Edition, McGraw Hill.
Essential References Materials	M.J. Moran and H.N. Shapiro, Fundamentals of Engineering Thermodynamics, 6th ed., John Wiley & Sons, 2008.
Electronic Materials	1. Lecture handouts and presentation on blackboard (https://tabuk.blackboard.com/webapps/login/?action=relogin) 2. Interactive Simulations: ● PhET Interactive Simulations (https://phet.colorado.edu/) 3. Online Courses and Lectures: ● Coursera (https://www.coursera.org/) ● edX (https://www.edx.org/) ● Khan Academy (https://www.khanacademy.org/) 4. Educational YouTube Channels: ● LearnEngineering (https://www.youtube.com/user/LearnEngineering)

	Engineering Journals and Databases: • ASME: The American Society of Mechanical Engineers (https://www.asme.org/) • ScienceDirect (https://www.sciencedirect.com/) 5. Virtual Labs: • Virtual Lab (http://www.vlab.co.in/) 6. Engineering Software: • AutoCAD (https://www.autodesk.com/products/autocad/overview) • SolidWorks (https://www.solidworks.com/) • Fusion 360 (https://www.autodesk.com/products/fusion-360/overview) • MATLAB (https://www.mathworks.com/products/matlab.html) • Python (https://www.python.org/) 7. Mechanical Engineering Apps: • Engineering Toolbox (https://www.engineeringtoolbox.com/) • Wolfram Alpha (https://www.wolframalpha.com/) 8. Discussion Forums: • Engineering Stack Exchange (https://engineering.stackexchange.com/) • Reddit - Mechanical Engineering (https://www.reddit.com/r/MechanicalEngineering/) 9. Webinars and Conferences: ASME Events (https://www.asme.org/events)
Other Learning Materials	1. **Lecture Notes and Tutorials:** • MIT OpenCourseWare (https://ocw.mit.edu/index.htm) • LectureNotes (https://lecturenotes.in/) 2. **Technical Blogs and Articles:** • Mechanical Engineering Blog (https://www.engineeringchoice.com/mechanical-engineering-blog/) • ASME's Mechanical Engineering Magazine (https://www.asme.org/topics-resources/society-news/asme-magazine) 3. **Industry Reports and Trends:** • McKinsey & Company - Mechanical Engineering (https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights) • Frost & Sullivan - Mechanical Engineering (https://ww2.frost.com/research/industry/mechanical-electrical/) 4. **Professional Organizations:** • Institution of Mechanical Engineers (IMechE) (https://www.imeche.org/) 5. **Technical Magazines:** • Mechanical Engineering Magazine (https://www.memagazine.org/) • Machine Design Magazine (https://www.machinedesign.com/)

	6. **Interactive Learning Platforms:** • Chegg Study (https://www.chegg.com/study) • Quizlet (thttps://quizlet.com/)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms equipped with data show. White Board.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Thermodynamics Lab

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

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Course Specifications

Course Title:	**Fluid mechanics 1**
Course Code:	**ME231**
Program:	**Bachelor of Science in Mechanical Engineering**
Department:	**Mechanical Engineering**
College:	**Faculty of Engineering**
Institution:	**University of Tabuk**

Table of Contents

A. Course Identification

1. Credit hours:3								
2. Course type								
a.	University	☐	College	☐	Department	x	Others	☐
b.	Required	x	Elective	☐				
3. Level/year at which this course is offered: 6/3								
4. Pre-requisites for this course (if any)**:** ENG204, MATH383								
5. Co-requisites for this course (if any)**:**								

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	60	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	30
3	**Tutorial**	
4	**Others** (specify)	
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

Introduction to fluid mechanics and units, properties of fluids, Fluid statics; Pressure measurements; Buoyancy and stability, Fluid flow kinematics, Conservation of mass, energy, and momentum, Differential form of equations, Stream and potential functions, Euler's equations, Bernoulli's equation, Dimensional analysis and similitude. Boundary layer Concepts, pipe flows. Pipe network and water hammer analysis.

2. Course Main Objective

1. Apply basic knowledge on various fluid properties and problems related to fluid mechanics.
2. Apply concepts of hydrostatic pressure in determining forces exerted by fluids on plane and curved surfaces under static condition.
3. Apply concept of buoyancy of objects immersed in fluids in determining the stability of floating bodies.
4. Comprehend the concepts necessary to analyze fluids in motion.

5. Identify differences between steady/unsteady, uniform/non-uniform and compressible/incompressible flow.
6. Construct streamlines and stream tubes.
7. Apply the concepts and application of the continuity, energy and momentum equations and flow measurements in fluid flows.
8. Solve problems of inviscid, irrotational, incompressible, and uniform using principles and conventions of potential flow.
9. Solve a variety of fluid flow problems using and limitations of the Bernoulli Equation involving streamlines, jets, energy lines, and hydraulic grade lines.
10. Calculate the friction and minor losses associated with pipe flow in piping systems and use it to determine turbine power output and pumping power requirements.
11. Solve practical problems involving different velocity profiles of laminar and turbulent flow in closed conduits and pipes with smooth and rough surfaces.
12. Study the boundary layer theory to calculate the boundary layer characteristics and also Boundary-layer control.
    Understand the basic principles governing lift and drag on immersed bodies and be able to solve elementary problems of this type

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Demonstrate the knowledge of fluid mechanics and units, properties of fluids, Fluid statics; Pressure measurements and boundary layer Concepts, pipe flows	K1
2	**Skills :**	
2.1	Solve static pressure , buoyancy and stability and Fluid flow kinematics problems	S1
2.2	Develop conservation of mass, energy, and momentum, differential form of equations, stream and potential functions, Euler's equations, Bernoulli's equation.	S1
2.3	Apply conservation of mass, energy, and momentum, differential form of equations, stream and potential functions, Euler's equations, Bernoulli's equation.	S1
2.4	Analyse fluid flow and water hammer in pipe network.	S1
2.5	Conduct experimentation to measeure fluid flow properties in different components	S3
3	**Values:**	
3.1		
3.2		

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to Fluid Mechanics: Definition of fluids, scope of fluid mechanics, and importance in engineering.	4
2.	Fluid Properties: Density, specific weight, viscosity, and surface tension of fluids.	4
3.	Fluid Statics: Analysis of fluids at rest, pressure measurements, and buoyancy.	4
4.	Fluid Kinematics: Study of fluid motion without considering the forces involved.	4
5.	Conservation of Mass: Application of continuity equation in fluid flow.	4
6.	Conservation of Energy: Application of energy equations and Bernoulli's equation.	4
7.	Conservation of Momentum: Application of momentum equations in fluid dynamics.	4

8.	Euler's Equations: Derivation and application of Euler's equations of motion.	4
9.	Pipe Flows and Networks: Analysis of fluid flow through pipes and networks.	4
10.	Differential Form of Equations: Transformation of fluid mechanics equations into differential form.	
11.	Stream and Potential Functions: Introduction and application of stream and potential functions.	4
12.	Boundary Layer Concepts: Understanding the boundary layer and its significance.	4
13.	Dimensional Analysis: Application of dimensional analysis and similitude in fluid mechanics.	4
14.	Cavitation and Water Hammer: Study of cavitation, water hammer, and their effects.	4
15.	Capillary Action: Analysis of capillary action in fluid systems.	4
	Total	60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Demonstrate the knowledge of fluid mechanics and units, properties of fluids, Fluid statics; Pressure measurements and boundary layer Concepts, pipe flows	Lecture	• Classwork • 1st Midterm Exams • 2nd Midterm Exams • Final Exam:
2.0	**Skills**		
2.1	Solve static pressure, buoyancy and stability and Fluid flow kinematics problems	Lecture, Problem based learning	• Classwork • 1st Midterm Exams • 2nd Midterm Exams • Final Exam:
2.2	Develop conservation of mass, energy, and momentum, differential form of equations, stream and potential functions, Euler's equations, Bernoulli's equation.		
2.3	Apply conservation of mass, energy, and momentum, differential form of equations, stream and potential functions, Euler's equations, Bernoulli's equation.		
2.4	Analyze fluid flow and water hammer in pipe network.		
2.5	Conduct experimentation to measure fluid flow properties in different components	Experimental based learning	• Lab Report & exam
3.0	**Values**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Classwork	2 to 14	15

#	Assessment task*	Week Due	Percentage of Total Assessment Score
2	1st Midterm Exams	6	15
3	2nd Midterm Exams	11	15
4	Lab Report & exam	2-14	15
5	Final Exam:	Last week	40
6			
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

The Mechanical Engineering Program (MEP) prioritize the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	D. Young and H. Okiishi, W. Huebsch, Fundamentals of Fluid Mechanics B. Munson. John Wiley and sons, 6th edition, 2010.
Essential References Materials	Robert W. Fox, Alan T. McDonald, Philip J., Introduction to Fluid Mechanics, 8th Edition, Wiley, 2010.
Electronic Materials	1. Lecture handouts and presentation on blackboard (https://tabuk.blackboard.com/webapps/login/?action=relogin) 2. Interactive Simulations: ● PhET Interactive Simulations (https://phet.colorado.edu/) 3. Online Courses and Lectures: ● Coursera (https://www.coursera.org/) ● edX (https://www.edx.org/) ● Khan Academy (https://www.khanacademy.org/) 4. Educational YouTube Channels: ● LearnEngineering (https://www.youtube.com/user/LearnEngineering) Engineering Journals and Databases: ● ASME: The American Society of Mechanical Engineers (https://www.asme.org/)

	• ScienceDirect (https://www.sciencedirect.com/) 5. Virtual Labs: • Virtual Lab (http://www.vlab.co.in/) 6. Engineering Software: • AutoCAD (https://www.autodesk.com/products/autocad/overview) • SolidWorks (https://www.solidworks.com/) • Fusion 360 (https://www.autodesk.com/products/fusion-360/overview) • MATLAB (https://www.mathworks.com/products/matlab.html) • Python (https://www.python.org/) 7. Mechanical Engineering Apps: • Engineering Toolbox (https://www.engineeringtoolbox.com/) • Wolfram Alpha (https://www.wolframalpha.com/) 8. Discussion Forums: • Engineering Stack Exchange (https://engineering.stackexchange.com/) • Reddit - Mechanical Engineering (https://www.reddit.com/r/MechanicalEngineering/) 9. Webinars and Conferences: ASME Events (https://www.asme.org/events)
Other Learning Materials	1. **Lecture Notes and Tutorials:** • MIT OpenCourseWare (https://ocw.mit.edu/index.htm) • LectureNotes (https://lecturenotes.in/) 2. **Technical Blogs and Articles:** • Mechanical Engineering Blog (https://www.engineeringchoice.com/mechanical-engineering-blog/) • ASME's Mechanical Engineering Magazine (https://www.asme.org/topics-resources/society-news/asme-magazine) 3. **Industry Reports and Trends:** • McKinsey & Company - Mechanical Engineering (https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights) • Frost & Sullivan - Mechanical Engineering (https://ww2.frost.com/research/industry/mechanical-electrical/) 4. **Professional Organizations:** • Institution of Mechanical Engineers (IMechE) (https://www.imeche.org/) 5. **Technical Magazines:** • Mechanical Engineering Magazine (https://www.memagazine.org/) • Machine Design Magazine (https://www.machinedesign.com/) 6. **Interactive Learning Platforms:** • Chegg Study (https://www.chegg.com/study) • Quizlet (thttps://quizlet.com/)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms equipped with data show. White Board.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Fluid mechanics and hydraulic Lab

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

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Course Specifications

Course Title:	**Electrical Engineering Fundamentals**
Course Code:	**ME243**
Program:	**Bachelor of Science in Mechanical Engineering**
Department:	**Mechanical Engineering**
College:	**Faculty of Engineering**
Institution:	**University of Tabuk**

Table of Contents

A. Course Identification

1. Credit hours: 3							
2. Course type							
a.	University ☐	College ☐	Department ☒	Others ☐			
b.	Required ☒	Elective ☐					
3. Level/year at which this course is offered: 5/3							
4. Pre-requisites for this course (if any)**:** MATH284, PHYS205							
5. Co-requisites for this course (if any)**:** **NA**							

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	60	100%
2	**Blended**	0	0%
3	**E-learning**	0	0%
4	**Distance learning**	0	0%
5	**Other**	0	0%

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	30
3	**Tutorial**	0
4	**Others** (specify)	0
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

Fundamentals and concepts of electric circuits, Resistive circuits, Thevinin and Norton's equivalent circuits, Active and reactive power, AC circuits and three phase circuit analysis, Transformers, Semiconductor materials. Diodes and Transistors circuits. Introduction to ideal Operational Amplifiers and its applications. Concepts of electrical motors.

2. Course Main Objective
Understand and analyze the fundamentals and concepts of electric circuits like: Resistive, Thevinin and Norton's equivalent, Active and reactive power, AC and three phase, Transformers, Diodes, transistors circuits, ideal operational amplifiers and its applications, and concepts of electrical motors. Moreover, conduct experimentation for electric circuits and motors performances.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Understand the fundamentals and concepts of electric circuits like : Resistive , Thevinin and Norton's equivalent , Active and reactive power, AC and three phase , Transformers, Diodes and Transistors circuits.	K1
1.2	Demonstrate the knowledge of ideal operational amplifiers and its applications and concepts of electrical motors.	K1
1.3		
1...		
2	**Skills :**	
2.1	Analyze electric circuits like: Resistive, Thevinin and Norton's equivalent, Active and reactive power, AC and three phase, Transformers, Diodes and Transistors circuits.	S1
2.2	Solve problems of ideal operational amplifiers and its applications and electrical motors	S1
2.3	Conduct experimentation for electric circuits and motors performances	S3
2...		
3	**Values:**	
3.1		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Introduction; Current; Voltage, and Resistance.	5
2	Ohm's and Kirchhoff's laws; Power; Series/parallel connections.	5
3	Voltage/current divider; Practical sources; Measuring current/voltage.	5
4	Thevenin and Norton's equivalent circuits.	4
5	Inductors; Capacitors; Series/parallel L & C Connections.	4
6	Solving AC circuits problems (Max and r.m.s values).	4
7	Phasors; Circuits in the phasor domain.	4
8	Circuit solving in the phasor domain.	4
9	Average, effective value of a waveform; AC Power; Power factor correction.	4
10	Three Phase Circuit Analysis.	4
11	Ideal Transformers.	4
12	Semiconductor materials: Diodes and Transistors circuits.	4
13	Inverting/noninverting/differential operational amplifiers.	4
14	Electrical Machines.	5
Total		60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Understand the fundamentals and concepts of electric circuits like: Resistive, Thevinin and Norton's equivalent, Active and reactive power, AC and three phase, Transformers, Diodes and Transistors circuits.	Lecture	• Classwork • 1st Midterm Exams • 2nd Midterm Exams Final Exam:
1.2	Demonstrate the knowledge of ideal operational amplifiers and its applications and concepts of electrical motors.		
…			
2.0	**Skills**		
2.1	Analyze electric circuits like: Resistive, Thevinin and Norton's equivalent, Active and reactive power, AC and three phase, Transformers, Diodes and Transistors circuits.	Lecture, Problem based learning	• Classwork • 1st Midterm Exams • 2nd Midterm Exams Final Exam:
2.2	Solve problems of ideal operational amplifiers and its applications and electrical motors		
2.3	Conduct experimentation for electric circuits and motors performances	Experimental based learning	• Lab Report & exam
3.0	**Values**		
3.1			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Classwork	Almost weekly	20%
2	Lab.	Almost weekly	20%
3	Midterm 1	7th	15%
4	Midterm 2	11th	15%
5	Final Exam	16th	30%
6			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:

The Mechanical Engineering Program (MEP) prioritize the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	• Introductory Circuit Analysis" By Robert L. Boylestad, 11th (12th, 11th or 10th) Edition, Published by Prentice Hall, 2001.
Essential References Materials	• Charles K. Alexander, Matthew N. O. Sadiku, Fundamentals of Electric Circuits, 5th Edition, McGraw-Hill, 2013.
Electronic Materials	• Course Page on Blackboard • Lecture Handouts • **Educational YouTube Channels:** • LearnEngineering (https://www.youtube.com/user/LearnEngineering) •
Other Learning Materials	1. **Lecture Notes and Tutorials:** • MIT OpenCourseWare (https://ocw.mit.edu/index.htm) • LectureNotes (https://lecturenotes.in/) •

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Classroom with 50 seats
Technology Resources (AV, data show, Smart Board, software, etc.)	• Data show, Blackboard Teaching-Learning Interface
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	• Electrical Laboratory

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

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Course Specifications

Course Title:	Mechanical vibrations
Course Code:	ME314
Program:	Bachelor of Science in Mechanical Engineering
Department:	Mechanical Engineering
College:	Faculty of engineering
Institution:	University of Tabuk

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Table of Contents

A. Course Identification

1. Credit hours: 3							
2. Course type							
a.	University	☐	College ☐	Department	☒ x	Others	☐
b.	Required	☒ x	Elective ☐				
3. Level/year at which this course is offered: **7/4**							
4. Pre-requisites for this course (if any)**:** **ME 212 & MATH 383**							
5. Co-requisites for this course (if any)**:** **None**							

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	60	100 %
2	**Blended**	0	0
3	**E-learning**	0	0
4	**Distance learning**	0	0
5	**other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	30
3	**Tutorial**	0
4	**Others** (specify)	0
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

Elements of vibration, Classification of vibration, Free and damped vibration of single degree of freedom systems, Viscous damping, Forced vibration, Resonance, Harmonic excitation, Rotating unbalance, Base motion, Vibration isolation, Vibration measuring, Critical speed of shaft. Two degrees of freedom systems, Undamped vibration absorber. Vehicle Suspension. Multidegree of freedom systems for free, damed, Undamped, and forced vibration. Tensional vibration: Two rotor system, Three rotor system, Tensional vibration of gear systems. Introduction to Continuous systems,

2. Course Main Objective

The main purpose of the course is to teach students about various types of mechanical vibrations as a core course in mechanical engineering plan.
Students will be taught to model systems, often using simplifications to approximate complex mechanisms. These models are used to determine vibration amplitudes, velocities, and accelerations, and also to determine resonant frequencies or normal modes for the systems. The course will

emphasize the relationship between the equations produced by the models and the physical characteristics of the real systems.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Recall the free and forced vibrations system with damping and undamping analysis with one and multi degree of freedom	K1
1.2	Describ how to suppression and absorption vibrations	K1
1.3	Recall the basic of the distributed parameter system	K1
1...		
2	**Skills :**	
2.1	Recall the free and forced vibrations system with damping and undamping analysis with one degree of freedom	S1
2.2	Solve the physical vibration phenomena with multi degree-of-freedom systems.	S1
2.3	Solve the vibration of the shaft and rotor	S1
2.4	Conduct material's mechanical vibrations experiments.	S3
3	**Values:**	
3.1		
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1.	Fundamental concepts in vibration and modeling.	2
2.	Free vibration of single degree of freedom systems: Undamped vibration, Simple harmonic motion, Damped vibration	2
3.	Free vibration of single degree of freedom systems: Modeling: Energy and Newton’s methods, Measurement of vibrational components, Design Consideration, Stability	2
4.	Forced harmonic excitation of single degree of freedom systems: Undamped vibration, Damped vibration	2
5.	Forced harmonic excitation of single degree of freedom systems: Base excitation, Rotating unbalance, Coulomb damping	2
6.	Vibration of single degree of freedom systems under general forcing conditions: Impulsive inputs, Arbitrary non periodic inputs, Arbitrary periodic inputs, Stability	2
7.	Vibration of multi -degree of freedom systems: Modeling, Free undamped vibration, Eigenvalue problem	2
8.	Vibration of multi -degree of freedom systems: Eigenvalue problem	2
9.	Vibration of multi -degree of freedom systems: Modal analysis, Free damped vibration, Forced vibration	2
10.	Design for Vibrations Suppression: Acceptable levels of vibrations, Vibration isolation	2
11.	Design for Vibrations Suppression: Vibration absorbers, Damping in vibration absorption, Critical speeds of rotating disks,	2

12.	Disturbed-Parameter systems: Vibration of a string or cable, Modes and natural frequencies	
13.	Disturbed-Parameter systems: Vibration of rods and bars	2
14.	Disturbed-Parameter systems: vibration, Bending vibration of a beam	2
15.	Disturbed-Parameter systems: Bending vibration of a beam	2
Total		60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Recall the free and forced vibrations system with damping and undamping analysis with one and multi degree of freedom	Lecture	• Classwork • 1st Midterm Exams • 2nd Midterm Exams • Final Exam:
1.2	Describe how to suppression and absorption vibrations		
1.3	Recall the basic of the distributed parameter system		
2.0	**Skills**		
2.1	Solve the physical vibration. phenomena with one degree of-freedom systems.	Lecture, Problem based learning	• Classwork • 1st Midterm Exams • 2nd Midterm Exams • Final Exam:
2.2	Solve the physical vibration phenomena with multi degree of-freedom systems.		
2.3	Solve the vibration of the shaft and rotor		
2.4	Conduct material's mechanical vibrations experiments.	Experimental based learning	• Lab Report & exam
3.0	**Values**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Classwork	2 to 14	15
2	1st Midterm Exams	6	15
3	2nd Midterm Exams	11	15
4	Lab Report & exam	2-14	15
5	Final Exam:	Last week	40

#	Assessment task*	Week Due	Percentage of Total Assessment Score
6			
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

The Mechanical Engineering Program (MEP) prioritize the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	**Daniel J. Inman, Engineering Vibrations, Pearson Education, Fourth Edition, 2011.**
Essential References Materials	**a. SingiresuRao, Mechanical Vibrations, Prentice-Hall, Fourth Edition, 2004.** **b. DukkapattiRao V., ”Text Book of Mechanical Vibration “ Prentice Hall of India Ltd, 2004.** **c. Meirovitch L, “Elements of Vibration analysis”, Tata McGrawHill, 2007.** **d. Journal of Mechanical Vibrations**
Electronic Materials	1. Lecture handouts and presentation on blackboard (https://tabuk.blackboard.com/webapps/login/?action=relogin) 2. Interactive Simulations: • PhET Interactive Simulations (https://phet.colorado.edu/) 3. Online Courses and Lectures: • Coursera (https://www.coursera.org/) • edX (https://www.edx.org/) • Khan Academy (https://www.khanacademy.org/) **4. Educational YouTube Channels:** • LearnEngineering (https://www.youtube.com/user/LearnEngineering)

	Engineering Journals and Databases: • ASME: The American Society of Mechanical Engineers (https://www.asme.org/) • ScienceDirect (https://www.sciencedirect.com/) **5. Virtual Labs:** • Virtual Lab (http://www.vlab.co.in/) 6. **Engineering Software:** • AutoCAD (https://www.autodesk.com/products/autocad/overview) • SolidWorks (https://www.solidworks.com/) • Fusion 360 (https://www.autodesk.com/products/fusion-360/overview) • MATLAB (https://www.mathworks.com/products/matlab.html) • Python (https://www.python.org/) 7. **Mechanical Engineering Apps:** • Engineering Toolbox (https://www.engineeringtoolbox.com/) • Wolfram Alpha (https://www.wolframalpha.com/) 8. **Discussion Forums:** • Engineering Stack Exchange (https://engineering.stackexchange.com/) • Reddit - Mechanical Engineering (https://www.reddit.com/r/MechanicalEngineering/) 9. **Webinars and Conferences:** ASME Events (https://www.asme.org/events)
Other Learning Materials	1. **Lecture Notes and Tutorials:** • MIT OpenCourseWare (https://ocw.mit.edu/index.htm) • LectureNotes (https://lecturenotes.in/) 2. **Technical Blogs and Articles:** • Mechanical Engineering Blog (https://www.engineeringchoice.com/mechanical-engineering-blog/) • ASME's Mechanical Engineering Magazine (https://www.asme.org/topics-resources/society-news/asme-magazine) 3. **Industry Reports and Trends:** • McKinsey & Company - Mechanical Engineering (https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights) • Frost & Sullivan - Mechanical Engineering (https://ww2.frost.com/research/industry/mechanical-electrical/) 4. **Professional Organizations:** • Institution of Mechanical Engineers (IMechE) (https://www.imeche.org/) 5. **Technical Magazines:** • Mechanical Engineering Magazine (https://www.memagazine.org/) • Machine Design Magazine (https://www.machinedesign.com/)

	6. **Interactive Learning Platforms:** • Chegg Study (https://www.chegg.com/study) • Quizlet (thttps://quizlet.com/)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms equipped with data show. White Board.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Mechanical vibrations and mechanics of machines lab.

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	Mechanical Design (1)
Course Code:	ME 315
Program:	Bachelor of Science in Mechanical Engineering
Department:	Mechanical Engineering
College:	Faculty of Engineering
Institution:	University of Tabuk

Table of Contents

A. Course Identification

1. Credit hours: 3	
2. Course type	
a. University ☐ College ☐ Department ☒ Others ☐	
b. Required ☒ Elective ☐	
3. Level/year at which this course is offered: 7/4	
4. Pre-requisites for this course (if any)**:** ME 212, ME 213	
5. Co-requisites for this course (if any)**:** None	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	60	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	30
3	**Tutorial**	0
4	**Others** (specify)	0
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

Fundamentals of mechanical design, codes and standards, factor of safety, and professional ethics. Review of stress analysis (combined stress, bending), Buckling, theories of failure, fatigue failure. Materials selection in mechanical design and safety factors, design of fasteners and connections: riveted, welded, bolted and bonded joints. shafts and axles, power screws, keys, clutches, springs, couplings, bolts, chains, and ropes, belts, and other elements. Application and term design project.

2. Course Main Objective
The main objective of ME315: Mechanical Design (1) course is to introduce students to various concepts and schemes of mechanical design, and to design various components of mechanical engineering, such as bolts, springs, welds, and, also, to study fatigue and static failure theories.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Identify the fundamentals of mechanical design, codes and standards, materials selection and factors of safety.	K1
1.2	Recall concepts of static and fatigue failure theories	K1
1.3	Identify the fundamentals of mechanical design, codes and standards, materials selection and factor of safety	K1
2	**Skills :**	
2.1	Apply engineering analysis principles and methods to the proper analysis of a variety of common mechanical system components	S1
2.2	Design shafts and axels for rotating machinery	S2
2.3	Select appropriate springs, welds, bolts, rivets, clutches, brakes, belts, ropes, chains, couplings, and screws for machine design	S2
3	**Values:**	
3.1	Understand the professional and ethical responsibility in mechanical engineering design.	V1

C. Course Content

No	List of Topics	Contact Hours
1.	**Ch. 1: Intro. To ME Design**: Design, Mechanical Engineering, Standard Design Process: Phases, Considerations, Design Engineer's Responsibilities, Standards & Codes, Economics, Stress & Strength, Uncertainty, Reliability, Dimensions & Tolerances, Units, Significant Figures.	4
2.	**Ch. 2: Materials**: Statistical Significance of Material Properties, Numbering Systems, Material Selection Process	4
3.	**Ch. 5: Failures Resulting from Static Loading**: Strain Failures, Static Strength, Stress Concentration, Failure Theories, Maximum- Shear-Stress Theory for Ductile Materials, Distortion-Energy Theory for Ductile Materials, Coulomb-Mohr	4
4.	**Ch. 5: Failures Resulting from Static Loading**: Theory for Ductile Materials, Maximum-Normal-Stress Theory for Brittle Materials, Modifications of the Mohr Theory for Brittle Materials, Fracture Mechanics: Stress Intensity Factor, Fracture Toughness.	4
5.	**Ch. 6: Fatigue Failure Resulting from Variable Loading**: Fatigue Failure in Metals, Fatigue Life Methods: Stress-Life Method : R. R. Moore, S-N Curve, The Strain-Life Method, Manson-Coffin Relationship, Linear-Elastic Fracture Mechanics Method	4
6.	**Ch. 6: Fatigue Failure Resulting from Variable Loading**: Paris Law for Crack Growth, Endurance Limit for Steels, Fatigue Strength, Endurance Limit Modifying Factors, Marin Modification Factors on Endurance Limit, Characterizing Fluctuating Stresses, Fatigue Failure Criteria for Fluctuating Stresses, Combination of Load Modes, Cumulative Fatigue Damage.	4
7.	**Ch. 7: Shafts and Shaft Components**: Shafts: Materials, Layout, Shaft Design for Stress : Critical Locations, Stress Analysis, Stress Concentration,.	4
8.	**Ch. 7: Shafts and Shaft Components**: Deflection Considerations, Critical Speeds for Shafts, Miscellaneous Shaft Components, Limits and Fits, Stress and Torque Capacity in Interference Fits.	4
9.	**Ch. 8: Screws, Fasteners, and the Design of Nonpermanent Joints**: Thread Terminology, Profile, Types, Power Screw, Mechanics of Power Screws, Self-Locking, Efficiency, Friction Coefficients, Stress Analysis, Threaded Fasteners, Joint-Fasteners Stiffness, Joint-Member Stiffness, Bolt Strength, Tensile Joints	4

10.	**Ch. 8: Screws, Fasteners, and the Design of Nonpermanent Joints**: - The External Load, Relating Bolt Torque to Bolt Tension, Statically Loaded Tension Joint with Preload, Casketed Joint, Fatigue Loading of Tension Joints, Bolted and Riveted Joint Loaded in Shear, Shear Joint with Eccentric Loading.	4
11.	**Ch. 9: Welding, Bonding, and the Design of Permanent Joints:** Welding Symbol, Butt and Fillet Welds, Stress in Fillet Welds, Torsional Stress in Welded Joints, Torsional Properties of Fillet Welds, Bending Stresses in Welded Joints, Bending Properties of Fillet Welds, The Strength of Welded Joints, Resistance Welding, Adhesive Bonding, Guidelines in Joint Design.	4
12.	**Ch. 10: Mechanical Springs**: Stresses in Helical Springs, Curvature Effect, Deflection of Helical Spring, Compression Spring, Stability, Spring Materials, Mechanical Properties of Spring Wire, Helical Compression Spring Design for Static Service, Critical Frequency of Helical Springs.	4
13.	**Ch. 10: Mechanical Springs**: Fatigue Loading of Helical Compression Springs, Helical Compression Spring Design for Fatigue Loading, Extension Spring, Analysis of Extension Spring, Helical Coil Torsion Spring, Miscellaneous Springs, Stresses in a Flat Triangular Spring.	4
14.	**Ch. 17: Design of Belts.**	4
15.	**Engineering Ethics Cases.**	4
	Total	60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Identify the fundamentals of mechanical design, codes and standards, materials selection and factors of safety.	Lecture	• Classwork • 1st Midterm Exams • 2nd Midterm Exams • Final Exam:
1.2	Recall concepts of static and fatigue failure theories		
1.3			
2.0	**Skills**		
2.1	Apply engineering analysis principles and methods to the proper analysis of a variety of common mechanical system components	Lecture, Problem based learning	• Classwork • 1st Midterm Exams • 2nd Midterm Exams • Final Exam:
2.2	Design shafts and axels for rotating machinery		
2.3	Select appropriate springs, welds, bolts, rivets, clutches, brakes, belts, ropes, chains, couplings, and screws for machine design		
3.0	**Values**		
3.1	Understand the professional and ethical responsibility in mechanical engineering design.	Lecture,	• Classwork • 1st Midterm Exams • 2nd Midterm Exams • Final Exam:

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Classwork	2 to 14	10
2	1st Midterm Exams	6	20
3	2nd Midterm Exams	11	20
4	Mini project	2-14	10
5	Final Exam:	Last week	40

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:

The Mechanical Engineering Program (MEP) prioritize the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	*Shigley's Mechanical Engineering Design* (10th Edition) Richard. G. Budynas, and J. Keith Nisbett McGraw-Hill Book Company, New York, 2012.
Essential References Materials	The Mechanical Design Process, 3rd Edition, David G. Ullman McGraw Hill Book Company, New York, 2003. (Good reference for the design process) Design of Machine Elements, 7th Edition, M.F. Spotts and T. E. Shoup Prentice-Hall, Inc., Upper Saddler River, New Jersey, 1998. (Good reference for fatigue and machine component design) Machine Design, An integrated Approach, 2nd Edition, Robert L. Norton, Prentice Hall, Upper Saddler River, New Jersey, 2000. (Good reference for fatigue and machine component design) Design of Machine and Structural Parts, Kurt M. Marshek, John Wiley and Sons, New York, 1987. (Good reference for shape-design of parts and joints between parts)
Electronic Materials	1. Lecture handouts and presentation on blackboard (https://tabuk.blackboard.com/webapps/login/?action=relogin) 2. Interactive Simulations:

	• PhET Interactive Simulations (https://phet.colorado.edu/) 3. Online Courses and Lectures: • Coursera (https://www.coursera.org/) • edX (https://www.edx.org/) • Khan Academy (https://www.khanacademy.org/) **4. Educational YouTube Channels:** • LearnEngineering (https://www.youtube.com/user/LearnEngineering) **Engineering Journals and Databases:** • ASME: The American Society of Mechanical Engineers (https://www.asme.org/) • ScienceDirect (https://www.sciencedirect.com/) **5. Virtual Labs:** • Virtual Lab (http://www.vlab.co.in/) 6. **Engineering Software:** • AutoCAD (https://www.autodesk.com/products/autocad/overview) • SolidWorks (https://www.solidworks.com/) • Fusion 360 (https://www.autodesk.com/products/fusion-360/overview) • MATLAB (https://www.mathworks.com/products/matlab.html) • Python (https://www.python.org/) 7. **Mechanical Engineering Apps:** • Engineering Toolbox (https://www.engineeringtoolbox.com/) • Wolfram Alpha (https://www.wolframalpha.com/) 8. **Discussion Forums:** • Engineering Stack Exchange (https://engineering.stackexchange.com/) • Reddit - Mechanical Engineering (https://www.reddit.com/r/MechanicalEngineering/) 9. **Webinars and Conferences:** ASME Events (https://www.asme.org/events)
Other Learning Materials	1. **Lecture Notes and Tutorials:** • MIT OpenCourseWare (https://ocw.mit.edu/index.htm) • LectureNotes (https://lecturenotes.in/) 2. **Technical Blogs and Articles:** • Mechanical Engineering Blog (https://www.engineeringchoice.com/mechanical-engineering-blog/) • ASME's Mechanical Engineering Magazine (https://www.asme.org/topics-resources/society-news/asme-magazine) 3. **Industry Reports and Trends:** • McKinsey & Company - Mechanical Engineering (https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights) • Frost & Sullivan - Mechanical Engineering (https://ww2.frost.com/research/industry/mechanical-electrical/)

	4. **Professional Organizations:** • Institution of Mechanical Engineers (IMechE) (https://www.imeche.org/) 5. **Technical Magazines:** • Mechanical Engineering Magazine (https://www.memagazine.org/) • Machine Design Magazine (https://www.machinedesign.com/) 6. **Interactive Learning Platforms:** • Chegg Study (https://www.chegg.com/study) • Quizlet (thttps://quizlet.com/)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Course was taught in classroom all the term.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	No Lab.

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAA
T4
2020

Course Specifications

Course Title:	**Automatic Control and Systems**
Course Code:	**ME316**
Program:	**Bachelor of Science in Mechanical Engineering**
Department:	**Mechanical Engineering**
College:	**Faculty of Engineering**
Institution:	**University of Tabuk**

Table of Contents

A. Course Identification

1. Credit hours: **3**
2. Course type **a.** University ☐ College ☐ Department √ Others ☐ **b.** Required √ Elective ☐
3. Level/year at which this course is offered: **8^{th}/ 4^{th}**
4. Pre-requisites for this course (if any): **ME 314 - ME 341**
5. Co-requisites for this course (if any): **None**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	30
3	Tutorial	
4	Others (specify)	
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

Introduction to control systems in the real world. Feedback Concept. Modeling of Electromechanical Systems. Block Diagrams. Signal Flow Graph. Sensitivity and Disturbance Analysis. Steady State Error Analysis. Stability Analysis. Analysis of Control Systems, Root Locus, Frequency Domain Analysis of Control Systems, Control System Design in the Frequency Domain. State Variable Modeling. State space representation. Controllability and Observability. State and Output Feedback Controller Design, Observer Design, Introduction to modern control; Introduction to PLC controllers, applications; Control design projects.

2. Course Main Objective

Feedback Concept.
Modeling of Electromechanical Systems.
Block Diagrams. Signal Flow Graph.

Steady State Error Analysis.
Stability Analysis.
Introduction to PLC controllers, applications.

3. Course Learning Outcomes

	CLOs	AlignedPLOs
1	**Knowledge and understanding**	
1.1	Demonstrate basic knowledge of logic gates and principle of programmable logic controllers (PLC).	K1
1.2	Sketch control systems using block diagrams and signal flow graphs.	K1
1.3	Explain fundamentals of control systems, concepts and give examples.	K1
1...		
2	**Skills :**	
2.1	Derive the system transfer function and output response using reduction rules and Masons' rule.	S1
2.2	Apply basic laws of physics to model different types of systems.	S1
2.3	Analyze steady state performance and stability of control systems.	S1
2.4		
2.5		
2.6		
3	**Values:**	
3.1		
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Introduction to Control Systems & Applications	10
2	Simplification of Block Diagrams.	10
3	Mathematical Models of Control Systems	10
4	Stability and Analysis of Control Systems	10
5	Introduction to PLC	10
6	Applications and Examples of PLC	10
7		
Total		60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Demonstrate basic knowledge of logic gates and principle of programmable logic controllers (PLC).	Lecture	• Classwork • 1st Midterm Exams • 2nd Midterm Exams • Final Exam:
1.2	Sketch control systems using block diagrams and signal flow graphs.		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
…	Explain fundamentals of control systems, concepts and give examples.		
2.0	**Skills**		
2.1	Derive the system transfer function and output response using reduction rules and Masons' rule.	Lecture, Problem based learning	• Classwork • 1st Midterm Exams • 2nd Midterm Exams • Final Exam:
2.2	Apply basic laws of physics to model different types of systems.		
2.3	Analyze steady state performance and stability of control systems.		
2.4			
2.5			
…			
3.0	**Values**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	**Classwork**	**2 to 15**	**20 %**
2	**Mid-term (1)**	**8**	**20 %**
3	**Mid-term (2)**	**12**	**20 %**
4	**Final Exam**	**Last week**	**40 %**
5			
6			
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:

The Mechanical Engineering Program (MEP) prioritize the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	**Control Systems Engineering, 6^{th} Ed., Norman S. Nise, Wiley, 2011.**
Essential References Materials	Modern Control Engineering, 4th Ed, Ogata
Electronic Materials	1. Lecture handouts and presentation on blackboard (https://tabuk.blackboard.com/webapps/login/?action=relogin) 2. Interactive Simulations: • PhET Interactive Simulations (https://phet.colorado.edu/) 3. Online Courses and Lectures: • Coursera (https://www.coursera.org/) • edX (https://www.edx.org/) • Khan Academy (https://www.khanacademy.org/) **4. Educational YouTube Channels:** • LearnEngineering (https://www.youtube.com/user/LearnEngineering) **Engineering Journals and Databases:** • ASME: The American Society of Mechanical Engineers (https://www.asme.org/) • ScienceDirect (https://www.sciencedirect.com/) **5. Virtual Labs:** • Virtual Lab (http://www.vlab.co.in/)
Other Learning Materials	1. Lecture handouts and presentation on blackboard (https://tabuk.blackboard.com/webapps/login/?action=relogin) 2. **Professional Organizations:** • Institution of Mechanical Engineers (IMechE) (https://www.imeche.org/) 3. **Technical Magazines:** • Mechanical Engineering Magazine (https://www.memagazine.org/) • Machine Design Magazine (https://www.machinedesign.com/) 4. **Interactive Learning Platforms:** • Chegg Study (https://www.chegg.com/study) • Quizlet (thttps://quizlet.com/)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms equipped with data show. White Board.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show.

Item	Resources
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Computer Lab

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes,Quality oflearning resources, etc.)
Evaluators (Students,Faculty, Program Leaders,Peer Reviewer, Others (specify)
Assessment Methods(Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

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Course Specifications

Course Title:	Mechanical Design (2)
Course Code:	ME317
Program:	Bachelor of Science in Mechanical Engineering
Department:	Mechanical Engineering
College:	Faculty of Engineering
Institution:	University of Tabuk

Table of Contents

A. Course Identification

1. Credit hours: 3				
2. Course type				
a.	University ☐	College ☐	Department ☒	Others ☐
b.	Required ☒	Elective ☐		
3. Level/year at which this course is offered: 8/4				
4. Pre-requisites for this course (if any)**:** ME315				
5. Co-requisites for this course (if any)**:** **None**				

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	60	100%
2	**Blended**	0	0
3	**E-learning**	0	0
4	**Distance learning**	0	0
5	**Other**	0	0

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	30
3	**Tutorial**	0
4	**Others** (specify)	0
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

Power transmission elements, Design of variable speed drives, Theory of hydrodynamic lubrication, Systems of lubrication and greasing, Rubbing and non-rubbing seals. Design of bearings(sliding-rolling), Gear design(spur-bevel-helical-worm), Optimum design, Design of brakes. Design, analysis and selection of mechanical systems. Introduction to the use of computers in mechanical design. Design project using computer facilities.

2. Course Main Objective

The main purpose for this course is to make students able to:

- Use the knowledge in Statics and Strength of Materials for design of machine elements.
- Learn the concepts of theory of hydrodynamic lubrication, systems of lubrication and greasing, and apply them in machine design.
- Design and select bearings (sliding – rolling).
- Design and select gears (spur – bevel – helical – worm).

- Design, analyze, and select mechanical systems.
- Design, analyze, and select breaks, couplings, and clutches.
- Design a project for a specific purpose utilizing knowledge acquired throughout the course.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	List different types of lubrications and their uses.	K1
1.2	Define gearing nomenclature.	K1
2	**Skills :**	
2.1	Solve ball, cylindrical roller, and tapered roller bearings problems.	S1
2.2	Solve journal-bearing lubrication problems.	S1
2.3	Solve statistical mechanical design problems	S1
2.5	Design of Spur and Helical gears.	S2
2.6 2.7	Design of Bevel and Worm gears	S2
2.8		
2.9		
3	**Values:**	
3.1	Recognize ethical mechanical design situations in a case study as per Engineer's Ethics Code.	V1
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	**Bearings** Bearing Types, Bearing Life, Bearing Load Life at Rated Reliability, Bearing Survival: Reliability versus Life, Relating Load, Life, and Reliability, Combined Radial and Thrust Loading, Variable Loading, Selection of Ball and Cylindrical Roller Bearings, Selection of Tapered Roller Bearings, Design Assessment for Selected Rolling-Contact Bearings**,** Lubrication, Mounting and Enclosure	16
2	**Gears – General** Types of Gear, Nomenclature, Conjugate Action, Involute Properties, Fundamentals, Contact Ratio, Interference, The Forming of Gear Teeth, Straight Bevel Gears, Parallel Helical Gears, Worm Gears ,Systems, Gear Trains , Force Analysis—Spur Gearing, Force Analysis—Bevel Gearing, Force Analysis—Helical Gearing, Force Analysis—Worm Gearing.	10
3	**Spur and Helical Gears** The Lewis Bending Equation, Surface Durability, AGMA Stress Equations, AGMA Strength Equations, Geometry Factors, The Elastic Coefficient, Dynamic Factor, Overload Factor, Surface Condition Factor, Load-Distribution Factor, Hardness-Ratio Factor, Stress Cycle Life Factors, Reliability Factor, Temperature Factor, Rim-Thickness Factor, Safety Factors, Analysis , Design of a Gear Mesh.	10

4	**Brakes and Clutches**	10
5	**Lubrication and Journal Bearings** Types of Lubrication, Viscosity, Petroff's Equation, Stable Lubrication, Thick-Film Lubrication, Hydrodynamic Theory, Design Considerations, The Relations of the Variables, Steady-State Conditions in Self-Contained Bearings, Clearance, Pressure-Fed Bearings, Loads and Materials, Bearing Types, Thrust Bearings, Boundary-Lubricated Bearings	10
6	**Statistical Analysis**	4
Total		60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	List different types of lubrications and their uses.	Lecture, Problem based learning	• Classwork • 1st Midterm Exams • 2nd Midterm Exams Final Exam
1.2	Define gearing nomenclature.		
1.3			
1.4			
1.5			
1.6			
1.7			
1.8			
2.0	**Skills**		
2.1	Solve ball, cylindrical roller, and tapered roller bearings problems.	Lecture, Problem based learning	• Classwork • 1st Midterm Exams • 2nd Midterm Exams Final Exam
2.2	Solve journal-bearing lubrication problems.		
2.3	Solve statistical mechanical design problems		
2.5	Design of Spur and Helical gears.		
2.62.7	Design of Bevel and Worm gears		
2.8			
2.9			
2.1			
2.2			
3.0	**Values**		
3.1	Recognize ethical mechanical design situations in a case study as per Engineer's Ethics Code.	Lecture, Problem based learning	• Classwork • 1st Midterm Exams • 2nd Midterm Exams Final Exam
3.2			
3.3			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Classwork	2 to 15	20 %
2	Mid-term (1)	8	20 %
3	Mid-term (2)	12	20 %
4	Final Exam	Last week	40 %
5			
6			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

The Mechanical Engineering Program (MEP) prioritize the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	(1) Richard G. Budynas and J. Keith Nisbett, Shigley's., “Mechanical Engineering Design”, 9th Edition, McGraw-Hill Science, 2011. (2) Norton, R.L., “Design of Machinery”, 2nd Edition, McGraw Hill, (2001). (3) Erdman, A.G., Sandor, G.N., Kota, S., “Mechanism Design Analysis and Synthesis – Volume 1”, 4th Edition, Prentice Hall, (2001).
Essential References Materials	(1) R.S. KHURMI and J.K. GUPTA., “A Textbook of Machine Design”, S.I. Units Edition, EURASIA PUBLISHING HOUSE (PVT.) LTD., 2005.. (2) ANSEL C. UGURAL., “Mechanical Design of Machine Components”, 2nd. Edition, CRC Press, 2015.
Electronic Materials	1. Lecture handouts and presentation on blackboard (https://tabuk.blackboard.com/webapps/login/?action=relogin) 2. Interactive Simulations: ● PhET Interactive Simulations (https://phet.colorado.edu/) 3. Online Courses and Lectures:

	• Coursera (https://www.coursera.org/) • edX (https://www.edx.org/) • Khan Academy (https://www.khanacademy.org/) **4. Educational YouTube Channels:** • LearnEngineering (https://www.youtube.com/user/LearnEngineering) **Engineering Journals and Databases:** • ASME: The American Society of Mechanical Engineers (https://www.asme.org/) • ScienceDirect (https://www.sciencedirect.com/) **5. Virtual Labs:** • Virtual Lab (http://www.vlab.co.in/) 6. **Engineering Software:** • AutoCAD (https://www.autodesk.com/products/autocad/overview) • SolidWorks (https://www.solidworks.com/) • Fusion 360 (https://www.autodesk.com/products/fusion-360/overview)
Other Learning Materials	ASME mechanical engineering design standards and online catalogs. • ASME's Mechanical Engineering Magazine (https://www.asme.org/topics-resources/society-news/asme-magazine)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Classrooms equipped with data show. • White Board.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	N/A

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

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Course Specifications

Course Title:	**Heat transfer**
Course Code:	**ME322**
Program:	**Bachelor of Science in Mechanical Engineering**
Department:	**Mechanical Engineering**
College:	**Faculty of Engineering**
Institution:	**University of Tabuk**

Table of Contents

A. Course Identification

1. Credit hours: 3	
2. Course type	
a. University ☐ College ☐ Department ☒ Others ☐	
b. Required ☒ Elective ☐	
3. Level/year at which this course is offered: 7/4	
4. Pre-requisites for this course (if any)**:** ME 221, ME 231	
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	60	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	30
3	**Tutorial**	
4	**Others** (specify)	
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

Basics modes of heat transfer. Thermal circuits, surface energy balance. Steady on-dimensional heat conduction, conduction across flat plate, cylindrical and spherical shells, and fins. Convection fundamental and correlations, external flow, internal flow, tube banks, impinging jets, packed beds. Types of heat exchangers, overall heat transfer coefficient, design of heat exchanger. Radiation, black body and gray radiation, view factor, radiation exchange between surfaces.

2. Course Main Objective

- Understanding Fundamental Heat Transfer Modes: Gain a deep understanding of the basic modes of heat transfer, including conduction, convection, and radiation.
- Application of Thermal Circuits: Apply the concept of thermal circuits to analyze and solve heat transfer problems, ensuring a balanced surface energy.

- Mastery of Steady One-Dimensional Heat Conduction: Develop proficiency in analyzing steady-state one-dimensional heat conduction across different geometries and the use of heat fins.
- Comprehensive Knowledge of Convection: Acquire a comprehensive knowledge of convection principles, covering external and internal flow, tube banks, impinging jets, and packed beds.
- Heat Exchanger Design and Analysis: Learn the design principles and analytical techniques for various types of heat exchangers, with a focus on determining overall heat transfer coefficients.
- Radiation Principles: Understand the principles of radiation, including black body and gray radiation, and apply view factor calculations to assess radiation exchange between surfaces.
- Integration of Sustainability Considerations: Identify and evaluate issues related to sustainability, economy, environment, politics, health, and safety in the context of solving complex engineering problems in heat transfer.
-

By the end of the course, students will have a solid foundation in heat transfer principles and their practical applications, along with the ability to critically assess engineering challenges with a consideration for broader societal and environmental implications.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Demonstrate the meaning of terminology and physical principles associated with heat transfer.	K1
2	**Skills :**	
2.1	Derive the differential equation that governs heat conduction in a large plane wall, a long cylinder, and a sphere, and generalize the results to three-dimensional cases in rectangular.	S1
2.2	Use requisite inputs for computing heat transfer rates by conduction, convection and radiation and/or material temperatures	S1
2.3	Design heat transfer systems and heat exchangers.	S2
2.4	Develop and conduct experimentation to calculate thermal conductivity, heat transfer rates, convection heat coefficient.	S3
2.5		
3	**Values:**	
3.1		
3.2		

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to Heat Transfer	4
2.	Conduction: Basics and One-Dimensional Steady-State	4
3.	Conduction: Two-Dimensional and Transient	4
4.	Conduction: Extended Surfaces (Fins)	4
5.	Convection: Fundamentals and External Flow	4
6.	Convection: Internal Flow and Tube Banks	4
7.	Convection: Impinging Jets and Packed Beds	4

8.	Heat Exchangers: Types and Classification	4
9.	Heat Exchangers: Design Principles	4
10.	Radiation: Basics and Black Body Radiation	
11.	Radiation: Gray Radiation and View Factors	4
12.	Radiation Exchange Between Surfaces	4
13.	Applications of Heat Transfer in Engineering	4
14.	Sustainability in Heat Transfer Solutions	4
15.	Comprehensive Case Studies in Heat Transfer	4
Total		60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Demonstrate the meaning of terminology and physical principles associated with heat transfer.	Lecture	• Classwork • 1st Midterm Exams • 2nd Midterm Exams • Final Exam:
2.0	**Skills**		
2.1	Derive the differential equation that governs heat conduction in a large plane wall, a long cylinder, and a sphere, and generalize the results to three-dimensional cases in rectangular.	Lecture, Problem based learning	• Classwork • 1st Midterm Exams • 2nd Midterm Exams • Final Exam:
2.2	Use requisite inputs for computing heat transfer rates by conduction, convection and radiation and/or material temperatures		
2.3	Design heat transfer systems and heat exchangers.		
2.5	Develop and conduct experimentation to calculate thermal conductivity, heat transfer rates, convection heat coefficient.	Experimental based learning	• Lab Report & exam
3.0	**Values**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Classwork	2 to 14	15
2	1st Midterm Exams	6	15
3	2nd Midterm Exams	11	15
4	Lab Report & exam	2-14	15

#	Assessment task*	Week Due	Percentage of Total Assessment Score
5	Final Exam:	Last week	40
6			
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

The Mechanical Engineering Program (MEP) prioritize the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Yunus A. Cengel., Heat Transfer: Practical Approach., 2nd Edition.
Essential References Materials	• D. S. Kumar, Heat and Mass Transfet, 8th ed., S. K. KAATARIA & SONS, 2013. • Holman, Heat Transfer, 10th ed. McGraw Hill, 2010.
Electronic Materials	1. Lecture handouts and presentation on blackboard (https://tabuk.blackboard.com/webapps/login/?action=relogin) 2. Interactive Simulations: • PhET Interactive Simulations (https://phet.colorado.edu/) 3. Online Courses and Lectures: • Coursera (https://www.coursera.org/) • edX (https://www.edx.org/) • Khan Academy (https://www.khanacademy.org/) 4. Educational YouTube Channels: • LearnEngineering (https://www.youtube.com/user/LearnEngineering) Engineering Journals and Databases: • ASME: The American Society of Mechanical Engineers (https://www.asme.org/) • ScienceDirect (https://www.sciencedirect.com/) 5. Virtual Labs: • Virtual Lab (http://www.vlab.co.in/)

	6. Engineering Software: • AutoCAD (https://www.autodesk.com/products/autocad/overview) • SolidWorks (https://www.solidworks.com/) • Fusion 360 (https://www.autodesk.com/products/fusion-360/overview) • MATLAB (https://www.mathworks.com/products/matlab.html) • Python (https://www.python.org/) 7. Mechanical Engineering Apps: • Engineering Toolbox (https://www.engineeringtoolbox.com/) • Wolfram Alpha (https://www.wolframalpha.com/) 8. Discussion Forums: • Engineering Stack Exchange (https://engineering.stackexchange.com/) • Reddit - Mechanical Engineering (https://www.reddit.com/r/MechanicalEngineering/) 9. Webinars and Conferences: ASME Events (https://www.asme.org/events)
Other Learning Materials	1. **Lecture Notes and Tutorials:** • MIT OpenCourseWare (https://ocw.mit.edu/index.htm) • LectureNotes (https://lecturenotes.in/) 2. **Technical Blogs and Articles:** • Mechanical Engineering Blog (https://www.engineeringchoice.com/mechanical-engineering-blog/) • ASME's Mechanical Engineering Magazine (https://www.asme.org/topics-resources/society-news/asme-magazine) 3. **Industry Reports and Trends:** • McKinsey & Company - Mechanical Engineering (https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights) • Frost & Sullivan - Mechanical Engineering (https://ww2.frost.com/research/industry/mechanical-electrical/) 4. **Professional Organizations:** • Institution of Mechanical Engineers (IMechE) (https://www.imeche.org/) 5. **Technical Magazines:** • Mechanical Engineering Magazine (https://www.memagazine.org/) • Machine Design Magazine (https://www.machinedesign.com/) 6. **Interactive Learning Platforms:** • Chegg Study (https://www.chegg.com/study) • Quizlet (thttps://quizlet.com/)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms equipped with data show. White Board.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Heat transfer, thermodynamics and combustion Lab.

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

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Course Specifications

Course Title:	**Thermodynamics 2**
Course Code:	**ME 323**
Program:	**Bachelor of Science in Mechanical Engineering**
Department:	**Mechanical Engineering**
College:	**Faculty of Engineering**
Institution:	**University of Tabuk**

Table of Contents

A. Course Identification

1. Credit hours: 3				
2. Course type				
a.	University ☐	College ☐	Department ☒ X	Others ☐
b.	Required ☒ X	Elective ☐		
3. Level/year at which this course is offered: 7/4				
4. Pre-requisites for this course (if any)**:** ME 221				
5. Co-requisites for this course (if any)**:**				

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	60	100%
2	**Blended**	0	0
3	**E-learning**	0	0
4	**Distance learning**	0	0
5	**Other**	0	0

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	30
3	**Tutorial**	0
4	**Others** (specify)	0
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

- The course in Thermodynamics 2 delves into advanced topics in thermodynamics, focusing on the second law and its applications in various systems. Students will explore irreversibility and availability, second law efficiency, and the entropy principle. The concept of exergy, both non-flow and flow, will be thoroughly examined, including the analysis of exergy destruction.
- The course proceeds to study vapor power cycles, with a detailed analysis of the basic Rankine cycle. Gas power cycles, including the Otto cycle, Diesel cycle, Dual cycle, and Brayton cycle, will be explored to understand their thermodynamic principles.
- The application of thermodynamics in refrigeration is a key component, covering vapor-compression refrigeration, refrigerant properties, and related concepts. The course also delves into nonreacting ideal gas mixtures and psychometrics, including the understanding of dry-bulb and wet-bulb temperatures.

By the end of the course, students will have a comprehensive understanding of advanced thermodynamic principles and their practical applications in various engineering systems.

2. Course Main Objective

Understand the Second Law of Thermodynamics:
- Comprehend the principles of irreversibility and availability.
- Analyze second law efficiency and apply the entropy principle.

Master Exergy Analysis:
- Differentiate between non-flow exergy and flow exergy.
- Evaluate and quantify exergy destruction in thermodynamic systems.

Explore gas and Vapor Power Cycles:
- Analyze and comprehend the operation of the basic Rankine cycle.
- Investigate gas power cycles, including the Otto cycle, Diesel cycle, Dual cycle, and Brayton cycle.

Understand Refrigeration Systems:
- Examine vapor-compression refrigeration systems.
- Analyze refrigerant properties and their impact on system performance.

Study Nonreacting Ideal Gas Mixtures and Psychometrics:
- Analyze the behavior of nonreacting ideal gas mixtures.
- Understand psychometric properties, including dry-bulb and wet-bulb temperatures.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Understand the Second law of thermodynamics.	K1
1.2	Acquire the principles, concepts and theories of Vapor power cycles , Otto cycle, Diesel cycle, Brayton cycle and refrigeration cycle.	K1
1.3		
2	**Skills :**	
2.1	Apply the second law of thermodynamics on thermodynamic systems	S1
2.2	Solve the vapor power cycles , Otto cycle, Diesel cycle, Brayton cycle, refrigeration cycle and gas miture, and psychometric problems.	S1
2.3	Perform experiments in vapor and gas power cycles.	S3

	CLOs	Aligned PLOs
2...		
3	**Values:**	
3.1		
3.2		

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to the Second Law of Thermodynamics: Overview of the second law principles and its significance.	4
2.	Irreversibility and Availability: Understanding irreversibility in processes and availability analysis.	4
3.	Second Law Efficiency: Calculation and interpretation of second law efficiency in thermodynamic systems.	4
4.	Entropy Principle: Application and implications of the entropy principle.	4
5.	Exergy Analysis: Differentiation between non-flow and flow exergy.	4
6.	Evaluation and quantification of exergy destruction. , Vapor Power Cycles: In-depth study of the basic Rankine cycle and its applications. , Analysis of gas power cycles, including Otto, Diesel, Dual, and Brayton cycles.	4
7.	Refrigeration Systems: Examination of vapor-compression refrigeration systems., Study of refrigerant properties and their impact on system performance.	4
8.	Nonreacting Ideal Gas Mixtures: Understanding the behavior of nonreacting ideal gas mixtures.	4
9.	Psychometrics: Analysis of psychometric properties, including dry-bulb and wet-bulb temperatures.	4
10.	Introduction to Exergy: Overview and importance of exergy in thermodynamic analysis.	4
11.	Exergy Destruction Analysis: Techniques for analyzing and minimizing exergy destruction in systems.	4
12.	Otto Cycle: In-depth study of the Otto cycle and its applications in internal combustion engines.	4
13.	Diesel Cycle: Analysis and application of the Diesel cycle in compression-ignition engines.	4
14.	Dual Cycle: Understanding the principles and applications of the Dual cycle.	4
15.	Brayton Cycle: In-depth study of the Brayton cycle and its applications in gas turbines.	4
	Total	60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Understand the Second law of thermodynamics.	Lecture	• Classwork

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.2	Acquire the principles, concepts and theories of Vapor power cycles , Otto cycle, Diesel cycle, Brayton cycle and refrigeration cycle.		• 1st Midterm Exams • 2nd Midterm Exams • Final Exam:
…			
2.0	**Skills**		
2.1	Apply the second law of thermodynamics on thermodynamic systems	Lecture, Problem based learning	• Classwork • 1st Midterm Exams • 2nd Midterm Exams • Final Exam:
2.2	Solve the vapor power cycles , Otto cycle, Diesel cycle, Brayton cycle, refrigeration cycle and gas miture, and psychometric problems.		
…	Perform experiments in vapor and gas power cycles.	Experimental based learning	• Lab Report & exam
3.0	**Values**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Classwork	2 to 14	20
2	1st Midterm Exams	6	15
3	2nd Midterm Exams	11	15
4	Lab Report & exam	2-14	20
5	Final Exam:	Last week	30

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

The Mechanical Engineering Program (MEP) prioritize the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Yunus A. Cengel, Michael A. Boles, Thermodynamics: An Engineering Approach, 7th Edition, McGraw-Hill, 2011
Essential References Materials	M.J. Moran and H.N. Shapiro, Fundamentals of Engineering Thermodynamics, 6th ed., John Wiley & Sons, 2008.
Electronic Materials	1. Lecture handouts and presentation on blackboard (https://tabuk.blackboard.com/webapps/login/?action=relogin) 2. Interactive Simulations: • PhET Interactive Simulations (https://phet.colorado.edu/) 3. Online Courses and Lectures: • Coursera (https://www.coursera.org/) • edX (https://www.edx.org/) • Khan Academy (https://www.khanacademy.org/) **4. Educational YouTube Channels:** • LearnEngineering (https://www.youtube.com/user/LearnEngineering) **Engineering Journals and Databases:** • ASME: The American Society of Mechanical Engineers (https://www.asme.org/) • ScienceDirect (https://www.sciencedirect.com/) **5. Virtual Labs:** • Virtual Lab (http://www.vlab.co.in/) 6. **Engineering Software:** • AutoCAD (https://www.autodesk.com/products/autocad/overview) • SolidWorks (https://www.solidworks.com/) • Fusion 360 (https://www.autodesk.com/products/fusion-360/overview) • MATLAB (https://www.mathworks.com/products/matlab.html) • Python (https://www.python.org/) 7. **Mechanical Engineering Apps:** • Engineering Toolbox (https://www.engineeringtoolbox.com/) • Wolfram Alpha (https://www.wolframalpha.com/) 8. **Discussion Forums:** • Engineering Stack Exchange (https://engineering.stackexchange.com/) • Reddit - Mechanical Engineering (https://www.reddit.com/r/MechanicalEngineering/) 9. **Webinars and Conferences:** • ASME Events (https://www.asme.org/events)
Other Learning Materials	1. **Lecture Notes and Tutorials:** • MIT OpenCourseWare (https://ocw.mit.edu/index.htm) • LectureNotes (https://lecturenotes.in/) 2. **Technical Blogs and Articles:** • Mechanical Engineering Blog (https://www.engineeringchoice.com/mechanical-engineering-blog/)

	• [ASME's Mechanical Engineering Magazine](https://www.asme.org/topics-resources/society-news/asme-magazine) (https://www.asme.org/topics-resources/society-news/asme-magazine) 3. **Industry Reports and Trends:** • McKinsey & Company - Mechanical Engineering (https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights) • Frost & Sullivan - Mechanical Engineering (https://ww2.frost.com/research/industry/mechanical-electrical/) 4. **Professional Organizations:** • Institution of Mechanical Engineers (IMechE) (https://www.imeche.org/) 5. **Technical Magazines:** • Mechanical Engineering Magazine (https://www.memagazine.org/) • Machine Design Magazine (https://www.machinedesign.com/) 6. **Interactive Learning Platforms:** • Chegg Study (https://www.chegg.com/study) • Quizlet (thttps://quizlet.com/)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms equipped with data show. White Board.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Thermodynamics Lab

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

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2020

Course Specifications

Course Title:	**Turbomachinery 1**
Course Code:	**ME332**
Program:	**Bachelor of Science in Mechanical Engineering**
Department:	**Mechanical Engineering**
College:	**Faculty of engineering**
Institution:	**University of Tabuk**

Table of Contents

A. Course Identification

1. Credit hours: 3	
2. Course type	
a. University ☐ College ☐ Department ☒ Others ☐	
b. Required ☒ Elective ☐	
3. Level/year at which this course is offered: 8/4	
4. Pre-requisites for this course (if any)**:** ME 231	
5. Co-requisites for this course (if any)**:** **None**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	60	100 %
2	**Blended**	0	0
3	**E-learning**	0	0
4	**Distance learning**	0	0
5	**other**	0	100 %

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	30
3	**Tutorial**	0
4	**Others** (specify)	0
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

Classifications of fluid machinery. Momentum and energy transfer between fluid and rotor. Principles and practice of scaling laws. Performance characteristics of centrifugal and axial flow fans, compressors and pumps. Positive displacement pumps. Cavitation and water-hammer problems. Valves, types and characteristics. Performance characteristics of axial and radial flow turbines. Fluid machinery noise.

2. Course Main Objective

The main objective of the course is to enable students to understand the fundamentals about turbomachinery, appreciate and apply the equations describing turbomachines, analyze the performances of turbomachines, and understand and apply the preliminary design steps toward the design of turbomachines. Specifically, the course exposes the students to the following:

- The general understanding of turbomachines and their classifications.
- The principles governing the operation and design of turbomachines.

- Analysis of turbomachines and their performance characteristics.
- Conduct several experiments on different turbomachines.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Acquire the principles, concepts and theories of turbomachinery and Valves, types and characteristics.	K1
1.2	Understand the phenomenon of cavitations and water-hammer problems and fluid machinery noise in turbomachines.	K1
1.3		
1...		
2	**Skills :**	
2.1	Solve the axial and radial flow pumps, compressors, fans and turbines problems.	S1
2.2	Design axial and radial flow pumps, compressors, fans and turbines to meet desired needs within realistic constraints.	S2
2.3	Conduct material's mechanical vibrations experiments.	S3
3	**Values:**	
3.1	NA	
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to the classifications, types, and applications of fluid machinery.	4
2.	Momentum and energy transfer between fluid and rotor	4
3.	Principles and practice of scaling laws.	4
4.	Centrifugal pumps performance characteristics	4
5.	Preliminary design procedure of pumps	4
6.	Pumping systems, applications, and pump selection	4
7.	Axial flow pumps	4
8.	Axial flow fans	4
9.	Centrifugal fans	4
10.	Centrifugal blowers	4
11.	Centrifugal compressors	4
12.	Performance characteristics of axial flow turbines	4
13.	Performance characteristics of radial flow turbines	4
14.	Hydraulic turbines.	4

15.	Fluid machinery noise	4
Total		60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Acquire the principles, concepts and theories of turbomachinery and Valves, types and characteristics.	Lecture	• Classwork • 1st Midterm Exams • 2nd Midterm Exams • Final Exam:
1.2	Understand the phenomenon of cavitations and water-hammer problems and fluid machinery noise in turbomachines.		
2.0	**Skills**		
2.1	Solve the axial and radial flow pumps, comperssors, fans and turbines problems.	Lecture, Problem based learning	• Classwork • 1st Midterm Exams • 2nd Midterm Exams • Final Exam:
2.2	Design axial and radial flow pumps, comperssors, fans and turbines to meet desired needs within realistic constraints .		
2.3	Perform experiments in the axial and radial flow turbomachines.	Experimental based learning	• Lab Report & exam
2.4			
3.0	**Values**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Classwork	2 to 14	15
2	1st Midterm Exams	6	15
3	2nd Midterm Exams	11	15
4	Lab Report & exam	2-14	15
5	Final Exam:	Last week	40
6			
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

The Mechanical Engineering Program (MEP) prioritize the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a

supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

<table>
<tr><td>Required Textbooks</td><td>Peng William W, Fundamentals of Turbomachinery, John Wiley & Sons, Inc. 2008.</td></tr>
<tr><td>Essential References Materials</td><td>Yahya S. M., Turbines, Compressors & Fans, Tata-McGraw Hill Co., 2nd Edition (2008).</td></tr>
<tr><td>Electronic Materials</td><td>1. Lecture handouts and presentation on blackboard (https://tabuk.blackboard.com/webapps/login/?action=relogin)
2. Interactive Simulations:
• PhET Interactive Simulations (https://phet.colorado.edu/)
3. Online Courses and Lectures:
• Coursera (https://www.coursera.org/)
• edX (https://www.edx.org/)
• Khan Academy (https://www.khanacademy.org/)
4. Educational YouTube Channels:
• LearnEngineering (https://www.youtube.com/user/LearnEngineering)
Engineering Journals and Databases:
• ASME: The American Society of Mechanical Engineers (https://www.asme.org/)
• ScienceDirect (https://www.sciencedirect.com/)
5. Virtual Labs:
• Virtual Lab (http://www.vlab.co.in/)
6. Engineering Software:
• AutoCAD (https://www.autodesk.com/products/autocad/overview)
• SolidWorks (https://www.solidworks.com/)
• Fusion 360 (https://www.autodesk.com/products/fusion-360/overview)
• MATLAB (https://www.mathworks.com/products/matlab.html)
• Python (https://www.python.org/)
7. Mechanical Engineering Apps:
• Engineering Toolbox (https://www.engineeringtoolbox.com/)
• Wolfram Alpha (https://www.wolframalpha.com/)
8. Discussion Forums:
• Engineering Stack Exchange (https://engineering.stackexchange.com/)</td></tr>
</table>

	• Reddit - Mechanical Engineering (https://www.reddit.com/r/MechanicalEngineering/) 9. **Webinars and Conferences:** ASME Events (https://www.asme.org/events)
Other Learning Materials	1. **Lecture Notes and Tutorials:** • MIT OpenCourseWare (https://ocw.mit.edu/index.htm) • LectureNotes (https://lecturenotes.in/) 2. **Technical Blogs and Articles:** • Mechanical Engineering Blog (https://www.engineeringchoice.com/mechanical-engineering-blog/) • ASME's Mechanical Engineering Magazine (https://www.asme.org/topics-resources/society-news/asme-magazine) 3. **Industry Reports and Trends:** • McKinsey & Company - Mechanical Engineering (https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights) • Frost & Sullivan - Mechanical Engineering (https://ww2.frost.com/research/industry/mechanical-electrical/) 4. **Professional Organizations:** • Institution of Mechanical Engineers (IMechE) (https://www.imeche.org/) 5. **Technical Magazines:** • Mechanical Engineering Magazine (https://www.memagazine.org/) • Machine Design Magazine (https://www.machinedesign.com/) 6. **Interactive Learning Platforms:** • Chegg Study (https://www.chegg.com/study) • Quizlet (thttps://quizlet.com/)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms equipped with data show. White Board.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Fluid mechanics and hydraulic lab.

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students	Online survey

Evaluation Areas/Issues	Evaluators	Evaluation Methods
	Head of the department	Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T4
2020

Course Specifications

Course Title:	**Instrumentation and Measurements**
Course Code:	**ME 333**
Program:	**Bachelor of Science in Mechanical Engineering**
Department:	**Mechanical Engineering**
College:	**College of Engineering**
Institution:	**University of Tabuk**

Table of Contents

A. Course Identification

1. Credit hours: 3							
2. Course type							
a.	University ☐	College ☐	Department ■	Others ☐			
b.	Required ■	Elective ☐					
3. Level/year at which this course is offered: 8/4							
4. Pre-requisites for this course (if any)**:** **ME 243-ME 314**							
5. Co-requisites for this course (if any)**:** **N.A**							

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	60	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	60
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Others** (specify)	
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

Fundamentals of measurement systems; fundamental measurement theory, Statistical analysis of experimental data; uncertainty analysis, various statistical distributions and test of goodness of fit; correlation coefficient and multivariable regression. Time dependent characteristics Analog input; Response of measuring systems, Sensors and transducers, electronics for instrumentation; analogue and digital instrumentation fundamentals, computer-based data acquisition; Introduction to applied mechanical measurements; Displacement and dimensional measurements; Measurement and analysis of stress and strain; Pressure; velocity; flow rate and temperature measurements.

2. Course Main Objective

Upon completion of this course, students will successfully:

- Understanding of the fundamentals of measurements systems.
- Be able to statistical analysis of experimental data.

- Be able to analysis of uncertainty of experimental data.
- Understanding of the basic electrical measurements and sensing devices.
- Understanding of data acquisition and processing.
- Understanding of displacement and dimensional measurements.
- Understanding of measurement and analysis of stress and strain.
- Understanding of measurement of pressure.
- Understanding of measurement of flow rate.
- Understanding of measurement of temperature.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Demonstrate basic knowledge of electrical measurements and sensing devices and their applications.	K1
1.2	Demonstrate the knowledge of sensors and transducer and their static characteristics.	K1
1.3	Explain fundamentals of measurement systems.	K1
1...		
2	**Skills :**	
2.1	Evaluate the combined standard uncertainty of the model of a measurement systems.	S1
2.2	Perform statistical analysis of experimental data.	S1
2.3		
2.4		
3	**Values:**	
3.1		
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Fundamentals of Measurements Systems	10
2	Statically Analysis of Experimental Data	10
3	Calculation of Uncertainties	10
4	Basic Electrical Measurements and Data Acquisition	15
5	Applied Mechanical Measurements	15
6		
7		
	Total	60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Demonstrate basic knowledge of electrical measurements and sensing devices and their applications.	Lecture	Classwork Midterm Exams Final Exam
1.2	Demonstrate the knowledge of sensors and transducer and their static characteristics.	Lecture	Classwork Midterm Exams Final Exam
1.3	Explain fundamentals of measurement systems.	Lecture	Classwork Midterm Exams Final Exam
2.0	**Skills**		
2.1	Evaluate the combined standard uncertainty of the model of a measurement systems.	Lecture	Classwork Midterm Exams Final Exam
2.2	Perform statistical analysis of experimental data.	Lecture	Classwork Midterm Exams Final Exam
2.3			
2.4			
3.0	**Values**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Classwork	2 to 15	20 %
2	Mid-term (1)	6	20 %
3	Mid-term (2)	9	20 %
4	Final Exam	Last week	40 %
5			
6			
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice : The Mechanical Engineering Program (MEP) prioritize the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally,

MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	• Jack P. Holman, Experimental Methods for Engineers, 7th Edition, McGraw-Hill, 2003.
Essential References Materials	- Handouts: Prepared by the instructor - David G. Alciatore, Michael B. Histand,, Introduction to Mechatronics and Measurement Systems, 3rd Edition, McGraw-Hill, 2007.
Electronic Materials	1. Lecture handouts and presentation on blackboard (https://tabuk.blackboard.com/webapps/login/?action=relogin) 2. Interactive Simulations: • PhET Interactive Simulations (https://phet.colorado.edu/) 3. Online Courses and Lectures: • Coursera (https://www.coursera.org/) • edX (https://www.edx.org/) • Khan Academy (https://www.khanacademy.org/) **4. Educational YouTube Channels:** • LearnEngineering (https://www.youtube.com/user/LearnEngineering) **Engineering Journals and Databases:** • ASME: The American Society of Mechanical Engineers (https://www.asme.org/) • ScienceDirect (https://www.sciencedirect.com/) **5. Virtual Labs:** • Virtual Lab (http://www.vlab.co.in/) 6. **Engineering Software:**
Other Learning Materials	1. **Lecture Notes and Tutorials:** • MIT OpenCourseWare (https://ocw.mit.edu/index.htm) • LectureNotes (https://lecturenotes.in/) 2. **Technical Blogs and Articles:** • Mechanical Engineering Blog (https://www.engineeringchoice.com/mechanical-engineering-blog/) • ASME's Mechanical Engineering Magazine (https://www.asme.org/topics-resources/society-news/asme-magazine)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms equipped with data show. White Board.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Computer Lab

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

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2020

Course Specifications

Course Title:	**Numerical Methods**
Course Code:	**ME341**
Program:	**Bachelor of Science in Mechanical Engineering**
Department:	**Mechanical Engineering**
College:	**Faculty of Engineering**
Institution:	**University of Tabuk**

Table of Contents

A. Course Identification

1. Credit hours: 3	
2. Course type	
a. University ☐ College ☐ Department ☒ Others ☐	
b. Required ☒ Elective ☐	
3. Level/year at which this course is offered: 7/4	
4. Pre-requisites for this course (if any): MATH 241, MATH 383	
5. Co-requisites for this course (if any):	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	45
2	Laboratory/Studio	0
3	Tutorial	0
4	Others (specify)	0
	Total	45

B. Course Objectives and Learning Outcomes

1. Course Description

Modeling, Computers and error analysis, Introduction to programming concepts including variable types, data structures, flow control, Root of equations, Linear algebraic equations, Optimization; Curve fitting; Numerical methods to interpolation and statistical regression, Numerical differential and integration; solution of linear and nonlinear equations, Eigen problems, Numerical methods for ordinary differential equations, Numerical methods for partial differential equations. Deterministic and probabilistic methods; Fundamentals of MATLAB programming and basic commands. Examples from Mechanical Engineering including lumped and continuum models from solid and fluid mechanics; heat transfer; dynamics and control; design and manufacturing. Assignments use MATLAB programming.

2. Course Main Objective
Provide students with a concrete idea of what numerical methods are and how they relate to engineering and scientific problem solving. Learning how mathematical models can be formulated on the basis of scientific principles to simulate the behavior of a simple physical system. Understanding how numerical methods afford a means to generate solutions in a manner that can be implemented on a digital computer. Learning about the different types of numerical methods.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Demonstrate understanding of Modeling, Computers and error analysis, Introduction to programming concepts including variable types, data structures, flow control.	K1
1...		
2	**Skills :**	
2.1	Derive numerical methods for curve fitting and interpolation, differentiation, integration, solution of linear and nonlinear equations and differential equations.	S1
2.2	Analyse and inspect the accuracy of common numerical methods.	S1
2.3	Implement numerical methods by using Matlab fundamentals and pre-defined functions to solve Mechanical Engineering models.	S1
3	**Values:**	
3.1		

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to Numerical Methods: Overview of numerical techniques and their role in solving engineering problems.	3
2.	Computational Modeling Fundamentals: Understanding the basics of creating mathematical models for engineering systems.	3
3.	Error Analysis in Numerical Computing: Techniques for assessing and minimizing errors in numerical simulations.	3
4.	Programming Concepts in Engineering: Introduction to programming, focusing on variables, data structures, and flow control relevant to mechanical engineering applications.	4
5.	Root Finding Algorithms: Techniques for finding roots of equations in engineering problems.	3
6.	Linear Algebraic Equations: Numerical methods for solving systems of linear equations.	3
7.	Optimization Methods: Application of optimization algorithms in engineering design and analysis.	3
8.	Curve Fitting Techniques: Methods for fitting curves to experimental data for accurate representation.	3
9.	Interpolation and Statistical Regression: Numerical techniques for interpolating data and performing statistical regression analysis.	3
10.	Numerical Differential Equations: Solving ordinary and partial differential equations using numerical methods.	3

11.	Eigenvalue Problems: Understanding and solving eigenvalue problems in mechanical engineering contexts.	3
12.	MATLAB Programming Fundamentals: Introduction to MATLAB programming language and its basic commands.	3
13.	Applications in Solid Mechanics: Utilizing numerical methods to model solid mechanics phenomena.	3
14.	Applications in Fluid Mechanics: Applying computational tools to simulate fluid flow and behavior.	3
15.	Examples in Dynamics, Control, Design, and Manufacturing: Illustrative examples showcasing the use of numerical methods in various mechanical engineering disciplines.	3
Total		45

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Demonstrate understanding of Modeling, Computers and error analysis, Introduction to programming concepts including variable types, data structures, flow control.	Lecture	• Classwork • 1st Midterm Exams • 2nd Midterm Exams Final Exam:
1.2			
…			
2.0	**Skills**		
2.1	Derive numerical methods for curve fitting and interpolation, differentiation, integration, solution of linear and nonlinear equations and differential equations.	Lecture, Problem based learning	• Classwork • 1st Midterm Exams • 2nd Midterm Exams Final Exam:
2.2	Analyse and inspect the accuracy of common numerical methods.		
2.3	Implement numerical methods by using Matlab fundametals and pre-defined functions to solve Mechanical Engineering models.		
3.0	**Values**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Classwork	2 to 14	20
2	1st Midterm Exams	6	20
3	2nd Midterm Exams	11	20
5	Final Exam:	Last week	40
6			
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice : The Mechanical Engineering Program (MEP) prioritize the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Steven C. Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientists, 3nd Edition, McGraw-Hill, 2012.
Essential References Materials	Steven T. Karris, Numerical Analysis, Using MATLAB and Excel, Third Edition Orchard Publications, , 2007
Electronic Materials	1. Lecture handouts and presentation on blackboard (https://tabuk.blackboard.com/webapps/login/?action=relogin) 2. Interactive Simulations: • PhET Interactive Simulations (https://phet.colorado.edu/) 3. Online Courses and Lectures: • Coursera (https://www.coursera.org/) • edX (https://www.edx.org/) • Khan Academy (https://www.khanacademy.org/) **4. Educational YouTube Channels:** • LearnEngineering (https://www.youtube.com/user/LearnEngineering) **Engineering Journals and Databases:** • ASME: The American Society of Mechanical Engineers (https://www.asme.org/) • ScienceDirect (https://www.sciencedirect.com/) **5. Virtual Labs:** • Virtual Lab (http://www.vlab.co.in/) 6. **Engineering Software:** • AutoCAD (https://www.autodesk.com/products/autocad/overview) • SolidWorks (https://www.solidworks.com/) • Fusion 360 (https://www.autodesk.com/products/fusion-360/overview)

	• MATLAB (https://www.mathworks.com/products/matlab.html) • Python (https://www.python.org/) 7. **Mechanical Engineering Apps:** • Engineering Toolbox (https://www.engineeringtoolbox.com/) • Wolfram Alpha (https://www.wolframalpha.com/) 8. **Discussion Forums:** • Engineering Stack Exchange (https://engineering.stackexchange.com/) • Reddit - Mechanical Engineering (https://www.reddit.com/r/MechanicalEngineering/) 9. **Webinars and Conferences:** ASME Events (https://www.asme.org/events)
Other Learning Materials	1. **Lecture Notes and Tutorials:** • MIT OpenCourseWare (https://ocw.mit.edu/index.htm) • LectureNotes (https://lecturenotes.in/) 2. **Technical Blogs and Articles:** • Mechanical Engineering Blog (https://www.engineeringchoice.com/mechanical-engineering-blog/) • ASME's Mechanical Engineering Magazine (https://www.asme.org/topics-resources/society-news/asme-magazine) 3. **Industry Reports and Trends:** • McKinsey & Company - Mechanical Engineering (https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights) • Frost & Sullivan - Mechanical Engineering (https://ww2.frost.com/research/industry/mechanical-electrical/) 4. **Professional Organizations:** • Institution of Mechanical Engineers (IMechE) (https://www.imeche.org/) 5. **Technical Magazines:** • Mechanical Engineering Magazine (https://www.memagazine.org/) • Machine Design Magazine (https://www.machinedesign.com/) 6. **Interactive Learning Platforms:** • Chegg Study (https://www.chegg.com/study) • Quizlet (thttps://quizlet.com/)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms equipped with data show. White Board.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show.

Item	Resources
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Computer Lab

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Computer-Aided Design**
Course Code:	**ME 342**
Program:	**Bachelor Science in Mechanical Engineering**
Department:	**Mechanical Engineering**
College:	**Faculty of Engineering**
Institution:	**University of Tabuk**

Table of Contents

A. Course Identification

1. Credit hours: 3	
2. Course type	
a. University ☐ College ☐ Department ☒ Others ☐	
b. Required ☒ Elective ☐	
3. Level/year at which this course is offered: Fall, 2021	
4. Pre-requisites for this course (if any)**:** ME 315, ME 341	
5. Co-requisites for this course (if any)**:** None	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	60	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	30
3	**Tutorial**	0
4	**Others** (specify)	0
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

Introduction. Basics of computer graphics, Mathematical formulation, two- and three-dimensional transformations, plane and space curves, curve fitting and surface generation, modeling, hidden line removal. Introduction to Finite Element Method and optimization techniques. Kinematic analysis, and animation of mechanical systems. Tools for CAD: hardware and software. CAD packages. Static linear analysis in one, two and three dimensions. Introduction to non-linear analysis. Optimum design. Computer applications in mechanical design. Incorporates projects in solid modeling, stress analysis of machine parts and structures, and mechanism response animation.

2. Course Main Objective

The objective of this course is to teach users the basic commands and tools necessary for professional 2D drawing, design and drafting using @Solidwork**.** After completing this course users will be able to use @Solidwork for daily working process, and navigate throughout @Solidwork using major navigating tools.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Recall knowledge of @Solidwork software SKETCH, FEATURES, and ASSEMBLY.	K1
1.2	Recall CAD theoretical parts.	K1
1.3	Recognize SOLID MODELLING schemes.	K1
2	**Skills :**	
2.1	Solve 2-D TRANSFORMATIONS problems using linear algebra techniques.	S1
2.2	Solve 3-DTRANSFORMATIONS problems using linear algebra techniques	S1
2.3	Solve analytical, interpolated, and approximated CURVES problems.	S1
2.4	Solve SURFACES problems.	S1
2.5	Practice use of @SOLIDWORKS software in designing various mechanical components.	S2
3	**Values:**	
3.1		
3.2		

C. Course Content

No	List of Topics	Contact Hours
1	Introduction to Computer Graphics.	6
2	Two-dimensional transformations.	10
3	Three-dimensional transformations.	10
4	Plane curves.	8
5	Space curves.	8
6	Surface Description and Generation	8
7	Introduction to Finite Element Method and optimization techniques. Kinematic analysis and animation of mechanical systems. Static linear analysis in one, two and three dimensions. Introduction to non-linear analysis.	10
	Total	60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Recall knowledge of @Solidwork software SKETCH, FEATURES, and ASSEMBLY.	Lecture	• Classwork • 1st Midterm Exams • 2nd Midterm Exams Final Exam:
1.2	Recall CAD theoretical parts.		
1.3	Recognize SOLID MODELLING schemes.		
2.0	**Skills**		
2.1	Solve 2-D TRANSFORMATIONS problems using linear algebra techniques.	Lecture,	• Classwork

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.2	Solve 3-DTRANSFORMATIONS problems using linear algebra techniques	Problem based learning	• 1st Midterm Exams • 2nd Midterm Exams Final Exam:
2.3	Solve analytical, interpolated, and approximated CURVES problems.		
2.4	Solve SURFACES problems.		
2.5	Practice use of @SOLIDWORKS software in designing various mechanical components.		
3.0	**Values**		
3.1			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Classwork	2 to 14	15
2	1st Midterm Exams	6	15
3	2nd Midterm Exams	11	15
4	Lab Report & exam	2-14	15
5	Final Exam:	Last week	40
6			
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:

The Mechanical Engineering Program (MEP) prioritize the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Theory: David F., Rogers and J. Alan, Adams, "Mathematical Elements for Computer Graphics" Tata McGraw Hill New Delhi, 2002. Lab.: Mastering SolidWorks ©: The Design Approach, 1st Edn., Ibrahim Zeid, Prentic Hall.

Essential References Materials	J. Rooney and P. Steadman, "Principles of computer aided design "Prentice Hall, INDIA 1998. (2) M. P. Groover and E. W. Zimmers, "CAD/CAM – Computer Aided Design and Manufacture", Prentice – Hall, India, 1984
Electronic Materials	1. Lecture handouts and presentation on blackboard (https://tabuk.blackboard.com/webapps/login/?action=relogin) 2. Interactive Simulations: • PhET Interactive Simulations (https://phet.colorado.edu/) 3. Online Courses and Lectures: • Coursera (https://www.coursera.org/) • edX (https://www.edx.org/) • Khan Academy (https://www.khanacademy.org/) **4. Educational YouTube Channels:** • LearnEngineering (https://www.youtube.com/user/LearnEngineering) **Engineering Journals and Databases:** • ASME: The American Society of Mechanical Engineers (https://www.asme.org/) • ScienceDirect (https://www.sciencedirect.com/) **5. Virtual Labs:** • Virtual Lab (http://www.vlab.co.in/) 6. **Engineering Software:** • AutoCAD (https://www.autodesk.com/products/autocad/overview) • SolidWorks (https://www.solidworks.com/) • Fusion 360 (https://www.autodesk.com/products/fusion-360/overview) • MATLAB (https://www.mathworks.com/products/matlab.html) • Python (https://www.python.org/) 7. **Mechanical Engineering Apps:** • Engineering Toolbox (https://www.engineeringtoolbox.com/) • Wolfram Alpha (https://www.wolframalpha.com/) 8. **Discussion Forums:** • Engineering Stack Exchange (https://engineering.stackexchange.com/) • Reddit - Mechanical Engineering (https://www.reddit.com/r/MechanicalEngineering/) 9. **Webinars and Conferences:** ASME Events (https://www.asme.org/events)
Other Learning Materials	1. **Lecture Notes and Tutorials:** • MIT OpenCourseWare (https://ocw.mit.edu/index.htm) • LectureNotes (https://lecturenotes.in/) 2. **Technical Blogs and Articles:** • Mechanical Engineering Blog (https://www.engineeringchoice.com/mechanical-engineering-blog/) • ASME's Mechanical Engineering Magazine (https://www.asme.org/topics-resources/society-news/asme-magazine) 3. **Industry Reports and Trends:**

	• McKinsey & Company - Mechanical Engineering (https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights) • Frost & Sullivan - Mechanical Engineering (https://ww2.frost.com/research/industry/mechanical-electrical/) 4. **Professional Organizations:** • Institution of Mechanical Engineers (IMechE) (https://www.imeche.org/) 5. **Technical Magazines:** • Mechanical Engineering Magazine (https://www.memagazine.org/) • Machine Design Magazine (https://www.machinedesign.com/) 6. **Interactive Learning Platforms:** • Chegg Study (https://www.chegg.com/study) • Quizlet (thttps://quizlet.com/)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms equipped with data show. White Board.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Computer lab.

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12

Date	12/02/1443

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA
T4
2020

Course Specifications

Course Title:	**Refrigeration and Air conditioning**
Course Code:	**ME424**
Program:	**Bachelor of Science in Mechanical Engineering**
Department:	**Mechanical Engineering**
College:	**Faculty of Engineering**
Institution:	**University of Tabuk**

Table of Contents

A. Course Identification

1. Credit hours: 3				
2. Course type				
a. University ☐	College ☐	Department ☒ x	Others ☐	
b. Required ☒ x	Elective ☐			
3. Level/year at which this course is offered: 9/5				
4. Pre-requisites for this course (if any)**:** ME323, ME333				
5. Co-requisites for this course (if any)**:**				

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	60	100
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	30
3	**Tutorial**	0
4	**Others** (specify)	0
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

Course Description:
Application of Refrigeration and Air Conditioning: Major uses. Air-conditioning processes and cycles. Refrigerant and refrigeration cycles. Outdoor design conditions and indoor design criteria. Load calculation. Refrigeration components and evaporative coolers. Air system basics: fan and duct systems, fan combinations in air-handling units and packaged units. Absorption systems: the absorption cycle. Air conditioning systems and selection. Students will use computer-based AC packages for homework and team projects.

2. Course Main Objective

This course provide students with a working knowledge of the principles of refrigeration and air conditioning and their applications. Different methods of refrigeration will be studied.

Also, psychometry and psychometric processes will be used in the purpose of air-conditioning. Further, the comfort air-conditioning is also addressed.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Demonstrate the meaning of the most terms related to refrigeration and the purpose of different components in refrigeration systems.	K1
1.2	Describe the numbering system used for designating refrigerants.	K1
1...		
2	**Skills :**	
2.1	Perform thermodynamic cyclic calculations for the standard vapour, actual, cascade and multi-evaporator refrigeration systems and plotting the cycle on T-s and p-h charts.	S1
2.2	Calculate the power input of an ideal reciprocating compressor and the actual compressor with clearance.	S1
2.3	Derive the expression for maximum COP of ideal absorption refrigeration system.	S1
2.4	Perform various cycle calculations of air refrigeration systems and show these cycles on psychrometric chart	S1
2.5	Solve problems involving psychrometry of air conditioning processes.	S1
2.6	Perform load calculations of buildings for selection of air conditioning equipment, after taking into account various types of heat transfers.	S1
2.7	develop and conduct several experimentation to calculate the performance of different cycles and plotting cycle on appropriate charts.	S3
3	**Values:**	
3.1		

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction (History of refrigeration)	**4**
2.	Fundamental revisions and	**4**
3.	Vapor Compression Systems	**4**
4.	Multi Pressure Systems	**4**
5.	Multi Evaporators Systems	**4**
6.	Different Components Of The Vapor Compression Refrigeration Systems	**4**
7.	Refrigerants	**4**
8.	Gas Cycle Refrigeration	**4**
9.	Properties of The Moist Air	**4**
10.	Psychometry of Air Conditioning Processes	**4**
11.	Air Conditioning Systems	**4**
12.	Load Calculation and Applied Psychometrics	**4**
13.	Transportation and Distribution of Air	**4**
14.	Absorption systems: the absorption cycle.	**4**
15.	Air conditioning systems and selection.	**4**
Total		60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Perform thermodynamic cyclic calculations for the standard vapour, actual, cascade and multi-evaporator refrigeration systems and plotting the cycle on T-s and p-h charts.	Lecture	• Classwork • 1st Midterm Exams • 2nd Midterm Exams • Final Exam:
1.2	Calculate the power input of an ideal reciprocating compressor and the actual compressor with clearance.		
…			
2.0	**Skills**		
2.1	Perform thermodynamic cyclic calculations for the standard vapour, actual, cascade and multi-evaporator refrigeration systems and plotting the cycle on T-s and p-h charts.	Lecture, Problem based learning	• Classwork • 1st Midterm Exams • 2nd Midterm Exams • Final Exam:
2.2	Calculate the power input of an ideal reciprocating compressor and the actual compressor with clearance.		
2.3	Derive the expression for maximum COP of ideal absorption refrigeration system.		
2.4	Perform various cycle calculations of air refrigeration systems and show these cycles on psychrometric chart		
2.5	Solve problems involving psychrometry of air conditioning processes.		
2.6	Perform load calculations of buildings for selection of air conditioning equipment, after taking into account various types of heat transfers.		
2.7	develop and conduct several experimentaion to calculate the performance of different cycles and ploting cycle on appropriate charts.	Experimental based learning	• Lab Report & exam
3.0	**Values**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Classwork	2 to 14	15
2	1st Midterm Exams	6	15
3	2nd Midterm Exams	11	15
4	Lab Report & exam	2-14	15
5	Final Exam:	Last week	40
6			
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice : The Mechanical Engineering Program (MEP) prioritize the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	**C.P. Arrora, "Refrigeration and air conditioning" Tata McGraw Hill, 2008, ISBN-13: 9780070083905.**
Essential References Materials	**ASHARE Handbook**
Electronic Materials	1. Lecture handouts and presentation on blackboard (https://tabuk.blackboard.com/webapps/login/?action=relogin) 2. Interactive Simulations: • PhET Interactive Simulations (https://phet.colorado.edu/) 3. Online Courses and Lectures: • Coursera (https://www.coursera.org/) • edX (https://www.edx.org/) • Khan Academy (https://www.khanacademy.org/) **4. Educational YouTube Channels:** • LearnEngineering (https://www.youtube.com/user/LearnEngineering) **Engineering Journals and Databases:** • ASME: The American Society of Mechanical Engineers (https://www.asme.org/) • ScienceDirect (https://www.sciencedirect.com/) **5. Virtual Labs:** • Virtual Lab (http://www.vlab.co.in/) 6. **Engineering Software:** • AutoCAD (https://www.autodesk.com/products/autocad/overview) • SolidWorks (https://www.solidworks.com/) • Fusion 360 (https://www.autodesk.com/products/fusion-360/overview) • MATLAB (https://www.mathworks.com/products/matlab.html) • Python (https://www.python.org/) 7. **Mechanical Engineering Apps:** • Engineering Toolbox (https://www.engineeringtoolbox.com/)

	• Wolfram Alpha (https://www.wolframalpha.com/) 8. **Discussion Forums:** • Engineering Stack Exchange (https://engineering.stackexchange.com/) • Reddit - Mechanical Engineering (https://www.reddit.com/r/MechanicalEngineering/) 9. **Webinars and Conferences:** ASME Events (https://www.asme.org/events)
Other Learning Materials	1. **Lecture Notes and Tutorials:** • MIT OpenCourseWare (https://ocw.mit.edu/index.htm) • LectureNotes (https://lecturenotes.in/) 2. **Technical Blogs and Articles:** • Mechanical Engineering Blog (https://www.engineeringchoice.com/mechanical-engineering-blog/) • ASME's Mechanical Engineering Magazine (https://www.asme.org/topics-resources/society-news/asme-magazine) 3. **Industry Reports and Trends:** • McKinsey & Company - Mechanical Engineering (https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights) • Frost & Sullivan - Mechanical Engineering (https://ww2.frost.com/research/industry/mechanical-electrical/) 4. **Professional Organizations:** • Institution of Mechanical Engineers (IMechE) (https://www.imeche.org/) 5. **Technical Magazines:** • Mechanical Engineering Magazine (https://www.memagazine.org/) • Machine Design Magazine (https://www.machinedesign.com/) 6. **Interactive Learning Platforms:** • Chegg Study (https://www.chegg.com/study) • Quizlet (thttps://quizlet.com/)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms equipped with data show. White Board.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Refrigeration and air conditioning Lab.

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME Department
Reference No.	
Date	1/9/2021

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA
T4
2020

Course Specifications

Course Title:	**Power and Desalination plants**
Course Code:	**ME425**
Program:	**Bachelor of Science in Mechanical Engineering**
Department:	**Mechanical Engineering**
College:	**Faculty of Engineering**
Institution:	**University of Tabuk**

Table of Contents

A. Course Identification

1. Credit hours: 3	
2. Course type	
a. University ☐ College ☐ Department ☒ Others ☐	
b. Required ☒ Elective ☐	
3. Level/year at which this course is offered: 10/5	
4. Pre-requisites for this course (if any)**:** ME323-ME444	
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	60	100%
2	**Blended**	0	0
3	**E-learning**	0	0
4	**Distance learning**	0	0
5	**Other**	0	0

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	30
3	**Tutorial**	0
4	**Others** (specify)	0
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

- Power stations classifications,
- steam power plant,
  - feed water heaters,
  - performance.
  - Steam generators,
  - fuels and combustion processes,
  - turbine,
  - water systems.
- Gas power stations and diesel power plant,
  - characteristics and performance.
- Combined power cycles.

- Co-generation concepts and systems.
- Power generation and environmental impact.
- Water desalination,
  - reverse osmosis,

multiple flash evaporator.

2. Course Main Objective

1. thanks to knowledge acquired previously in the course of (Thermodynamics 1, 2 and heat transfer fluid mechanics).
2. Apply ideal and real Rankine cycle analysis to steam power cycles to estimate thermal efficiency, and work as a function of pressures and temperatures at various points in the cycle.
3. Identify the basic components of the steam power cycles.
4. Describe the operating principle of the basic components of the steam power cycles.
5. Apply heat and mass balance on the basic components of the steam power cycles.
6. Apply ideal and real gas cycle analysis to Diesel, and Brayton power cycles to estimate thermal efficiency, and work as a function of pressures and temperatures at various points in the cycle.
7. Identify the basic components of the gas power cycles.
8. Describe the operating principle of the basic components of the Gas power cycles.
9. Apply heat and mass balance on the basic components of the Brayton power cycles.
10. Explain how the water cycle works.
11. List technologies engineers have developed to desalinate ocean water.
12. Understand how the RO and MFE water desalination systems works
13. Apply heat and mass balance to RO and MFE basic components and units

Evaluate the performance of the water desalination units based on the productivity and energy consumptions

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Demonstrate the principles, concepts and theories of power plants and RO and MSF desalnation	K1
1.2		
1.3		
1...		
2	**Skills :**	
2.1	Solve steam and gas power plants problems.	**S1**
2.2	Solve combined and cogeneration power plants problems.	**S1**

CLOs		Aligned PLOs
2.3	Solve Steam generators, fuels and combustion processes problems.	**S1**
2...		
3	**Values:**	
3.1		
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Power stations classification	6
2	steam power plant	6
3	feed water heaters, performance	
4	Steam generators	6
5	fuels and combustion processes	6
6	steam turbine	6
7	water systems	
8	Gas power stations characteristics and performance	6
9	diesel power plant, characteristics and performance	
10	Combined power cycles characteristics and performance	6
11	Co-generation concepts and systems	
12	Power generation and environmental impact	6
13	Water desalination, reverse osmosis	6
14	Water desalination, multiple flash evaporator	6
15		
Total		60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Demonstrate the principles, concepts and theories of power plants and RO and MSF desalination	Lecture, Problem based learning	• Classwork • 1st Midterm Exams • 2nd Midterm Exams Final Exam:
1.2			
…			
2.0	**Skills**		
2.1	Solve steam and gas power plants problems.	Lecture, Problem based learning	• Classwork • 1st Midterm Exams • 2nd Midterm Exams Final Exam:
2.2	Solve combined and cogeneration power plants problems.		
…	Solve Steam generators, fuels and combustion processes problems.		
3.0	**Values**		
3.1			

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Classwork	2 to 15	30 %
2	Mid-term (1)	8	15 %
3	Mid-term (2)	12	15 %
4	Final Exam	Last week	40 %
5			
6			
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

The Mechanical Engineering Program (MEP) prioritize the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	J. K. Gupta, R. S. Khurmi, A Textbook of Thermal Engineering, ISBN13- 9788121925730, S. Chand & Company Ltd., 2011
Essential References Materials	H.T. El-Dessouky, H.M. Ettouney, Fundamentals of Salt Water Desalination, ELSEVIER, 2002 M. M. El-Wakil, Power plant Technology , Mcgraw-Hill Book Co. Inc. K.S. Spiegler and A.D.K. Laird, Academic Press, New York 1980
Electronic Materials	http://www.vgb.org/db_kks_eng.html http://www.tva.gov/power/coalart.htm http://www.bls.gov/oco/ocos227.htm

	http://www.idadesal.org/ http://www.desalyearbook.com/desalination-timeline http://wwws-ag.com/Sea-water-treatment.732.0.html http://www.dme-ev.de/
Other Learning Materials	1. **Lecture Notes and Tutorials:** • MIT OpenCourseWare (https://ocw.mit.edu/index.htm) • LectureNotes (https://lecturenotes.in/) 2. **Technical Blogs and Articles:** • Mechanical Engineering Blog (https://www.engineeringchoice.com/mechanical-engineering-blog/) • ASME's Mechanical Engineering Magazine (https://www.asme.org/topics-resources/society-news/asme-magazine) 3. **Industry Reports and Trends:** • McKinsey & Company - Mechanical Engineering (https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights) • Frost & Sullivan - Mechanical Engineering (https://ww2.frost.com/research/industry/mechanical-electrical/) 4. **Professional Organizations:** • Institution of Mechanical Engineers (IMechE) (https://www.imeche.org/) 5. **Technical Magazines:** • Mechanical Engineering Magazine (https://www.memagazine.org/) • Machine Design Magazine (https://www.machinedesign.com/) 6. **Interactive Learning Platforms:** • Chegg Study (https://www.chegg.com/study) • Quizlet (thttps://quizlet.com/)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Classrooms equipped with data show. • White Board. • Mechanical Design Software lab.
Technology Resources (AV, data show, Smart Board, software, etc.)	• White Board • Data Show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA
T4
2020

Course Specifications

Course Title:	**Basic Hydraulic and Pneumatic Systems**
Course Code:	**ME434**
Program:	**Bachelor of Science in Mechanical Engineering**
Department:	**Mechanical Engineering**
College:	**Faculty of Engineering**
Institution:	**University of Tabuk**

Table of Contents

A. Course Identification

1. Credit hours: 3			
2. Course type			
a. University ☐	College ☐	Department ■	Others ☐
b. Required ■	Elective ☐		
3. Level/year at which this course is offered: 9/5			
4. Pre-requisites for this course (if any): **ME 332-ME 333**			
5. Co-requisites for this course (if any): **N.A**			

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	60	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	30
3	**Tutorial**	
4	**Others** (specify)	
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

The basics of hydraulic and pneumatic systems, Hydraulic Circuits, Main pneumatic circuits, Control of several hydraulic and pneumatic cylinders, Hydraulic and pneumatic control valves, Characteristics and selection of positive and non-positive displacement pumps. Characteristics and standards of filters, Linear and rotary hydraulic Actuators. Characteristics and design of hydraulic and pneumatic distribution systems; Design; sizing and analysis of hydraulic and pneumatic circuits, Design and application of hydraulic and pneumatic systems.

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2. Course Main Objective

Upon completion of this course, students will successfully:

- Demonstrate the knowledge of different types of hydraulic and pneumatic systems and their characteristics, operation, and applications.

- Demonstrate the knowledge of the main components of hydraulic and pneumatic systems and their functions and symbols.
- Explain Fundamental Physical Principles of Hydraulics and Pneumatics
- Analyze hydraulic and pneumatic systems
- Design basic and advanced hydraulic, pneumatic and electro-pneumatic control circuits

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Demonstrate the knowledge of types of hydraulic and pneumatic systems and their characteristics, operation, and applications.	K1
1.2	Demonstrate the knowledge base of the main components of the hydraulic and pneumatic systems and their functions and symbols	K1
1.3	Explain Fundamental Physical Principles of Hydraulics.	K1
1...		
2	**Skills :**	
2.1	Analyze hydraulic and pneumatic systems.	S1
2.2	Design basic and advanced hydraulic, pneumatic and electro-pneumatic control circuits.	S2
2.3		
2.4		
3	**Values:**	
3.1		
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Types of hydraulic and pneumatic systems and their characteristics, operation, and applications.	12
2	The main components of the hydraulic and pneumatic systems	8
3	Functions and symbols of hydraulic and pneumatic parts.	12
4	Physical Principles of Hydraulics	8
5	Analyze hydraulic and pneumatic systems	8
6	Design of hydraulic and pneumatic systems	12
7		
Total		60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Demonstrate the knowledge of types of hydraulic and pneumatic systems and their characteristics, operation, and applications.	Lecture	Classwork Midterm Exams Final Exam
1.2	Demonstrate the knowledge base of the main components of the hydraulic and pneumatic systems and their functions and symbols	Lecture	Classwork Midterm Exams Final Exam
1.3	Explain Fundamental Physical Principles of Hydraulics.	Lecture	Classwork Midterm Exams Final Exam
2.0	**Skills**		
2.1	Analyze hydraulic and pneumatic systems.	Lecture Problem based learning	Classwork Midterm Exams Final Exam
2.2	Design basic and advanced hydraulic, pneumatic and electro-pneumatic control circuits.	Lecture Problem based learning	Classwork Midterm Exams Final Exam
2.3			
2.4			
3.0	**Values**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Classwork	2 to 15	20 %
2	Midterm 1	6	20 %
3	Mid-term 2	8	20 %
4	Final Exam	Last week	40 %
5			
6			
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

The Mechanical Engineering Program (MEP) prioritize the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a

supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Anthony Esposito, Fluid Power with Applications, Prentice Hall, 2003.
Essential References Materials	- Handouts: Prepared by the instructor - Majumdar S.R., "Oil Hydraulic Systems Principles and Maintenance" Tata McGraw Hill, New Delhi, 2005. - Rabie, M. Galal, Fluid Power Engineering, ISBN: 9780071622462, McGraw-Hill, c2009
Electronic Materials	1. Lecture handouts and presentation on blackboard (https://tabuk.blackboard.com/webapps/login/?action=relogin) 2. Interactive Simulations: ● PhET Interactive Simulations (https://phet.colorado.edu/) 3. Online Courses and Lectures: ● Coursera (https://www.coursera.org/) ● edX (https://www.edx.org/) ● Khan Academy (https://www.khanacademy.org/) **4. Educational YouTube Channels:** ● LearnEngineering (https://www.youtube.com/user/LearnEngineering) **Engineering Journals and Databases:** ● ASME: The American Society of Mechanical Engineers (https://www.asme.org/) ● ScienceDirect (https://www.sciencedirect.com/) **5. Virtual Labs:** ● Virtual Lab (http://www.vlab.co.in/) 6. **Engineering Software:** ● AutoCAD (https://www.autodesk.com/products/autocad/overview) ● SolidWorks (https://www.solidworks.com/) ● Fusion 360 (https://www.autodesk.com/products/fusion-360/overview) ● MATLAB (https://www.mathworks.com/products/matlab.html) ● Python (https://www.python.org/)

Other Learning Materials	Fluid sim documentation 1. **Lecture Notes and Tutorials:** • MIT OpenCourseWare (https://ocw.mit.edu/index.htm) • LectureNotes (https://lecturenotes.in/) 2. **Technical Blogs and Articles:** • Mechanical Engineering Blog (https://www.engineeringchoice.com/mechanical-engineering-blog/)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms equipped with data show. White Board.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Computer Lab

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA
T4
2020

Course Specifications

Course Title:	**Mechatronics (1)**
Course Code:	**ME444**
Program:	**Bachelor of Science in Mechanical Engineering**
Department:	**Mechanical Engineering**
College:	**College of Engineering**
Institution:	**University of Tabuk**

Table of Contents

A. Course Identification

1. Credit hours: 3	
2. Course type	
a. University ☐ College ☐ Department ■ Others ☐	
b. Required ■ Elective ☐	
3. Level/year at which this course is offered: 9/5	
4. Pre-requisites for this course (if any)**:** **ME 243- ME 316**	
5. Co-requisites for this course (if any)**:** **N.A**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	60	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	30
3	**Tutorial**	
4	**Others** (specify)	
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

This course introduces the basic principles of mechatronics systems design. It also gives introduction to AC circuits, Introduction to semiconductor, Introduction to ideal diodes, introduction to NPN and FET transistors, D/A and A/D convertors, Introduction to Digital Circuits, Introduction to electrical motors, introduction to robotics.

2. Course Main Objective

- Identify AC circuits, semiconductor, ideal diodes, NPN and FET transistors
- Explain the design process of mechatronics systems
- Determine the proper characteristics of mechatronics components such as motors and sensors
- Identify system control and signal systems for D/A and A/D convertors

- Identify the basics for robotics.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Identify AC circuits, semiconductor, ideal diodes, NPN and FET transistors	K1
1.2	Determine the proper characteristics of mechatronics components	K1
1.3	Identify the basics for robotics	K1
1...		
2	**Skills :**	
2.1	Explain the design process of mechatronics systems	S1
2.2	Identify SYSTEM CONTROL and SIGNAL SYSTEMS	S1
2.3		
2.4		
3	**Values:**	
3.1		
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Basics AC circuits, semiconductor, ideal diodes, NPN and FET transistors	8
2	Basic design process of mechatronic systems	12
3	Characteristics of mechatronics components	12
4	Basic D/A and A/D convertors	8
5	Basic Signal systems and digital circuits	8
6	Basics of robotics	12
7		
	Total	60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Identify AC circuits, semiconductor, ideal diodes, NPN and FET transistors	Lecture	Classwork Midterm Exams Final Exam
1.2	Determine the proper characteristics of mechatronics components	Lecture	Classwork Midterm Exams Final Exam
1.3	Identify the basics for robotics	Lecture	Classwork Midterm Exams Final Exam
2.0	**Skills**		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.1	Explain the design process of mechatronics systems	Lecture , Problem based learning	Classwork Midterm Exams Final Exam
2.2	Identify system control and signal systems	Lecture Problem based learning	Classwork Midterm Exams Final Exam
2.3			
2.4			
3.0	**Values**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Classwork	2 to 15	20 %
2	Mid-term 1	6	20 %
3	Mid-term 2	9	20 %
4	Final Exam	Last week	40 %
5			
6			
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

The Mechanical Engineering Program (MEP) prioritize the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Alciatore, D. G. and Histand, M. B., Introduction to Mechatronics and Measurement Systems, McGraw Hill, 2003

Essential References Materials	• Handouts: Prepared by the instructor • Shetty and Kolk, Mechatronics System Design, Second Edition, 2010
Electronic Materials	1. Lecture handouts and presentation on blackboard (https://tabuk.blackboard.com/webapps/login/?action=relogin) 2. Interactive Simulations: • PhET Interactive Simulations (https://phet.colorado.edu/) 3. Online Courses and Lectures: • Coursera (https://www.coursera.org/) • edX (https://www.edx.org/) • Khan Academy (https://www.khanacademy.org/) **4. Educational YouTube Channels:** • LearnEngineering (https://www.youtube.com/user/LearnEngineering) **Engineering Journals and Databases:** • ASME: The American Society of Mechanical Engineers (https://www.asme.org/) • ScienceDirect (https://www.sciencedirect.com/) **5. Virtual Labs:** • Virtual Lab (http://www.vlab.co.in/)
Other Learning Materials	Tinker CAD website (Autodesk) for development and simulation of mechatronic circuits 1. **Lecture Notes and Tutorials:** • MIT OpenCourseWare (https://ocw.mit.edu/index.htm) • LectureNotes (https://lecturenotes.in/) 2. **Technical Blogs and Articles:** • Mechanical Engineering Blog (https://www.engineeringchoice.com/mechanical-engineering-blog/)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms equipped with data show. White Board.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Computer Lab

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

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Course Specifications

Course Title:	**Engineering pipelines**
Course Code:	**ME452**
Program:	**Bachelor of Science in Mechanical Engineering**
Department:	**Mechanical Engineering**
College:	**Faculty of Engineering**
Institution:	**University of Tabuk**

Table of Contents

A. Course Identification

1. Credit hours: 3	
2. Course type	
a. University ☐ College ☐ Department ☒ Others ☐	
b. Required ☐ Elective ☒	
3. Level/year at which this course is offered: 9/5	
4. Pre-requisites for this course (if any)**:** ME 231, ME332	
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	30
3	Tutorial	
4	Others (specify)	
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

This course includes introduction and basic concept in fluid mechanics application, Head loss formulas, pump theory characteristics, Types of pipelines, pipelines materials, Incompressible flow in pipelines and pipe network analysis, Flow in pipelines, Power transmission by pipelines, Stresses in pipelines, Design of pipe line, Design of layout and supports.

2. Course Main Objective

- Gain working background on Fluid mechanics applications in pipelines networks
- Train students in analyzing pipeline network, Design of pipelines, materials used in piping industry,

- Solve complex pipeline network using numerical method for solving system of non-linear equations.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Demonstrate the knowledge of Basic concepts, Types of pipelines, Incompressible flow in pipelines and pipe networks.	K1
2	**Skills :**	
2.3	Analyze the Flow in a pipeline with uniform Draw-off, Inertia Pressure in pipelines and Power Transmission by pipelines .	S1
2...	Calculate Stresses in pipelines based on flow properties and Pipelines Materials.	S1
	Design a pipeline based on the codes and standards to satisfy technical and economical constraints	S2
3	**Values:**	
3.1		
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to Fluid Mechanics Applications in Pipelines	4
2.	Head Loss Formulas in Pipeline Engineering	4
3.	Pump Theory Characteristics	4
4.	Types of Pipelines and Materials	4
5.	Incompressible Flow in Pipelines	4
6.	Pipe Network Analysis	4
7.	Flow in Pipelines	4
8.	MS Excel and Epanet Software for Pipeline Analysis	4
9.	Complex Pipeline Engineering Problems	4
10.	Power Transmission by Pipelines	4
11.	Stresses in Pipelines	4
12.	Pipeline Design Principles	4
13.	Design of Layout and Supports	4
14.	Sustainability in Pipeline Engineering	4

15	Economic, Environmental, and Social Considerations in Pipeline Projects	4
Total		60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Demonstrate the knowledge of Basic concepts, Types of pipelines, Incompressible flow in pipelines and pipe networks.	Lecture	• Classwork • 1st Midterm Exams • 2nd Midterm Exams • Final Exam:
2.0	**Skills**		
2.1	Analyze the Flow in a pipeline with uniform Draw-off, Inertia Pressure in pipelines and Power Transmission by pipelines .	Lecture, Problem based learning	• Classwork • 1st Midterm Exams • 2nd Midterm Exams Final Exam:
2.2	Calculate Stresses in pipelines based on flow properties and Pipelines Materials.		
2.3	Design a pipeline based on the codes and standards to satisfy technical and economical constraints		
3.0	**Values**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Classwork	2 to 14	20
4	1st Midterm Exams	6	20
5	2nd Midterm Exams	11	20
7	Final Exam:	Last week	40
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

The Mechanical Engineering Program (MEP) prioritize the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	**"Hydraulics of Pipeline Systems" by** Bruce Larock, Roland Jeppson and Gary Watters
Essential References Materials	Fluid Mechanics With Engineering Applications 10th Edition by E. Finnemore (Author), Joseph Franzini (Author)
Electronic Materials	1. Lecture handouts and presentation on blackboard (https://tabuk.blackboard.com/webapps/login/?action=relogin) 2. Interactive Simulations: • PhET Interactive Simulations (https://phet.colorado.edu/) 3. Online Courses and Lectures: • Coursera (https://www.coursera.org/) • edX (https://www.edx.org/) • Khan Academy (https://www.khanacademy.org/) **4. Educational YouTube Channels:** • LearnEngineering (https://www.youtube.com/user/LearnEngineering) **Engineering Journals and Databases:** • ASME: The American Society of Mechanical Engineers (https://www.asme.org/) • ScienceDirect (https://www.sciencedirect.com/) **5. Virtual Labs:** • Virtual Lab (http://www.vlab.co.in/) 6. **Engineering Software:** • AutoCAD (https://www.autodesk.com/products/autocad/overview) • SolidWorks (https://www.solidworks.com/) • Fusion 360 (https://www.autodesk.com/products/fusion-360/overview) • MATLAB (https://www.mathworks.com/products/matlab.html) • Python (https://www.python.org/) 7. **Mechanical Engineering Apps:** • Engineering Toolbox (https://www.engineeringtoolbox.com/) • Wolfram Alpha (https://www.wolframalpha.com/) 8. **Discussion Forums:** • Engineering Stack Exchange (https://engineering.stackexchange.com/) • Reddit - Mechanical Engineering (https://www.reddit.com/r/MechanicalEngineering/) 9. **Webinars and Conferences:** ASME Events (https://www.asme.org/events)

Other Learning Materials	1. **Lecture Notes and Tutorials:** • MIT OpenCourseWare (https://ocw.mit.edu/index.htm) • LectureNotes (https://lecturenotes.in/) 2. **Technical Blogs and Articles:** • Mechanical Engineering Blog (https://www.engineeringchoice.com/mechanical-engineering-blog/) • ASME's Mechanical Engineering Magazine (https://www.asme.org/topics-resources/society-news/asme-magazine) 3. **Industry Reports and Trends:** • McKinsey & Company - Mechanical Engineering (https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights) • Frost & Sullivan - Mechanical Engineering (https://ww2.frost.com/research/industry/mechanical-electrical/) 4. **Professional Organizations:** • Institution of Mechanical Engineers (IMechE) (https://www.imeche.org/) 5. **Technical Magazines:** • Mechanical Engineering Magazine (https://www.memagazine.org/) • Machine Design Magazine (https://www.machinedesign.com/) 6. **Interactive Learning Platforms:** • Chegg Study (https://www.chegg.com/study) • Quizlet (thttps://quizlet.com/)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms equipped with data show. White Board.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAA
T4
2020

Course Specifications

Course Title:	**Finite element methods and application in design**
Course Code:	**ME 466**
Program:	**Bachelor of Science in Mechanical Engineering**
Department:	**Mechanical Engineering**
College:	**Faculty of engineering**
Institution:	**Tabuk university**

Table of Contents

A. Course Identification

1. Credit hours: 3								
2. Course type								
a.	University	☐	College	☐	Department	☒	Others	☐
b.	Required	☐	Elective	☒				
3. Level/year at which this course is offered: **10/5**								
4. Pre-requisites for this course (if any)**:** ME 342-ME 317								
5. Co-requisites for this course (if any)**:** **None**								

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	60	100 %
2	**Blended**	0	0
3	**E-learning**	0	0
4	**Distance learning**	0	0
5	**Other**	0	0

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	30
3	**Tutorial**	0
4	**Others** (specify)	0
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

Introduction to finite element methods; Basic concepts of finite element methods; one, two and three dimensional analysis; General steps in the finite element method; Direct stiffness (equilibrium) method to solve finite element problems; Formulation and application of spring, bar, truss and beam elements; Types of analyses: statics and dynamics model, linear, nonlinear, static, modal, vibration, buckling, thermal; Finite Element Analysis (FEA) modeling techniques, common modeling errors; Implementation and management of FEA used as a design tool; Mechanical engineering applications using FE software

2. Course Main Objective

At the end of the course the students will be able to:

- Understand the general steps of finite element methods.

- Understand the basic finite element formulation techniques.
- Be able to derive equations in finite element methods for 1D, 2D and 3D problems.
- Be able to formulate and solve basic problems in heat transfer, solid mechanics and fluid mechanics.
- Be able to write computer program based on finite element methods. - Be able to use a commercial software, to solve basic engineering problems in heat transfer, solid mechanics and fluid mechanics.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Demonstrate the knowledge of basic finite element formulation techniques	K1
2	**Skills :**	
2.1	Analyze the finite element methods in 1D, 2D and 3D problems	S1
2.2	Solve basic problems in heat transfer, solid mechanics and fluid mechanics	S1
3	**Values:**	
3.1		
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1.	course materials and course assessment	4
2.	Introduction to finite element methods.	4
3.	The method of weighted residuals and Galerkin approximations.	4
4.	FEM in one dimension.	4
5.	FEM in one dimension.	4
6.	The 2-D triangular element.	4
7.	The 2-D quadrilateral element.	4
8.	Isoparametric 2-D elements.	4
9.	The 3-D element.	4
10.	The 3-D element.	4
11.	Finite elements in solid mechanics	4
12.	Finite elements in solid mechanics	4
13.	Application to LS-DYNA software. Tensile test and impact sphere	4
14.	Application to LS-DYNA software. Heat transfer problem	4
15.	Application to LS-DYNA software. Vibration problem	4
Total		60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Demonstrate the knowledge of basic finite element formulation techniques	Lecture	• Classwork • 1st Midterm Exams • 2nd Midterm Exams Final Exam:
2.0	**Skills**		
2.1	Analyze the finite element methods in 1D, 2D and 3D problems	Lecture, Problem based learning	• Classwork • 1st Midterm Exams • 2nd Midterm Exams • Final Exam:
2.2	Solve basic problems in heat transfer, solid mechanics and fluid mechanics		
3.0	**Values**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Classwork	2 to 14	10
2	1st Midterm Exams	6	20
3	2nd Midterm Exams	11	20
4	Mini project	2-14	10
5	Final Exam:	Last week	40
6			
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

The Mechanical Engineering Program (MEP) prioritize the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Cook, R.D., Finite Element Modeling for Stress Analysis. John Wiley & Sons, Toronto, 1995.
Essential References Materials	Frank L. Stasa, Applied Finite Elements for Engineers, Holt, Reinhart, 1985, ISBN 0-03-062737-0. Logan, A First Course in Finite Element Method, P.W.S. Engineering, 2nd edition, 1992. W. Bickford, A First Course in Finite Element Method, Irwin, 1990.
Electronic Materials	1. Lecture handouts and presentation on blackboard (https://tabuk.blackboard.com/webapps/login/?action=relogin) 2. Interactive Simulations: ● PhET Interactive Simulations (https://phet.colorado.edu/) 3. Online Courses and Lectures: ● Coursera (https://www.coursera.org/) ● edX (https://www.edx.org/) ● Khan Academy (https://www.khanacademy.org/) **4. Educational YouTube Channels:** ● LearnEngineering (https://www.youtube.com/user/LearnEngineering) **Engineering Journals and Databases:** ● ASME: The American Society of Mechanical Engineers (https://www.asme.org/) ● ScienceDirect (https://www.sciencedirect.com/) **5. Virtual Labs:** ● Virtual Lab (http://www.vlab.co.in/) 6. **Engineering Software:** ● AutoCAD (https://www.autodesk.com/products/autocad/overview) ● SolidWorks (https://www.solidworks.com/) ● Fusion 360 (https://www.autodesk.com/products/fusion-360/overview) ● MATLAB (https://www.mathworks.com/products/matlab.html) ● Python (https://www.python.org/) 7. **Mechanical Engineering Apps:** ● Engineering Toolbox (https://www.engineeringtoolbox.com/) ● Wolfram Alpha (https://www.wolframalpha.com/) 8. **Discussion Forums:** ● Engineering Stack Exchange (https://engineering.stackexchange.com/) ● Reddit - Mechanical Engineering (https://www.reddit.com/r/MechanicalEngineering/) 9. **Webinars and Conferences:** ASME Events (https://www.asme.org/events)
Other Learning Materials	1. **Lecture Notes and Tutorials:** ● MIT OpenCourseWare (https://ocw.mit.edu/index.htm) ● LectureNotes (https://lecturenotes.in/)

	2. **Technical Blogs and Articles:** • Mechanical Engineering Blog (https://www.engineeringchoice.com/mechanical-engineering-blog/) • ASME's Mechanical Engineering Magazine (https://www.asme.org/topics-resources/society-news/asme-magazine) 3. **Industry Reports and Trends:** • McKinsey & Company - Mechanical Engineering (https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights) • Frost & Sullivan - Mechanical Engineering (https://ww2.frost.com/research/industry/mechanical-electrical/) 4. **Professional Organizations:** • Institution of Mechanical Engineers (IMechE) (https://www.imeche.org/) 5. **Technical Magazines:** • Mechanical Engineering Magazine (https://www.memagazine.org/) • Machine Design Magazine (https://www.machinedesign.com/) 6. **Interactive Learning Platforms:** • Chegg Study (https://www.chegg.com/study) • Quizlet (thttps://quizlet.com/)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms equipped with data show. White Board.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Computer lab

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation Areas/Issues	Evaluators	Evaluation Methods

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

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NCAAA
T4
2020

Course Specifications

Course Title:	Composite Materials
Course Code:	ME473
Program:	Bachelor of Science in Mechanical Engineering
Department:	Department of Mechanical
College:	Faculty of Engineering
Institution:	University of Tabuk

Table of Contents

A. Course Identification

1. Credit hours: 3	
2. Course type	
a. University ☐ College ☐ Department ☒ Others ☐	
b. Required ☐ Elective ☒	
3. Level/year at which this course is offered: Fall, 2021	
4. Pre-requisites for this course (if any)**:** ME 213, ME 202	
5. Co-requisites for this course (if any)**:** None	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	30
3	Tutorial	0
4	**Others** (specify)	0
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

Classification; Applications; Processing and fabrication of composites (polymer matrix, metal-matrix, ceramic-matrix); resin systems; reinforced systems; fibers and matrices; fibers architecture; elastic deformation; properties; Design Considerations; Laminate structures; honeycomb materials; Stress-strain characteristics of fiber- reinforced materials; Lamination theory; Failure theories of fiber-reinforced materials; environmentally induced stresses in laminates.

2. Course Main Objective
Introduce to advanced composite materials and their applications. Develop fundamental relationships for predicting the mechanical and hygrothermal response of multi layered materials and structures. Develop micromechanical and macro-mechanical relationships for lamina and laminated materials with emphasis on continuous filament. Introduce material, structural, and strength optimization to design laminated composite materials.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Introduce composite materials and their classification, properties, and applications.	K1
1.2	Discuss the experimental characterization of the nine mechanical and four hygrothermal constants as well as understand the code for laminate stacking sequence.	K1
1.3	Understand the significance of stiffness, and hygrothermal and mechanical response of special cases of laminates.	K1
1...		
2	**Skills :**	
2.1	Develop fundamental relationships for predicting the mechanical and hygrothermal response of multi layered materials and structures.	S1
2.2	Develop micromechanical and macro-mechanical relationships for lamina and laminated materials with emphasis on continuous filament.	S1
2.3	Establish the failure criteria for laminates based on failure of individual lamina in a laminate.	S1
2.4	Design a composite materials rotating shaft.	S2
3	**Values:**	
3.1		
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Chapter 1. Introduction to Composite Materials	4
2	Chapter 2. Macromechanical Analysis of Lamina	14
3	Chapter 3. Micromechanical Analysis of Lamina	14
4	Chapter 4. Macromechanical Analysis of Laminates	14
5	Chapter 5. failure, Analysis, and Design of Laminates	14
...		
	Total	60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.1	Introduce composite materials and their classification, properties, and applications.	Lecture	• Classwork • 1st Midterm Exams • 2nd Midterm Exams Final Exam:
1.2	Discuss the experimental characterization of the nine mechanical and four hygrothermal constants as well as understand the code for laminate stacking sequence.		
1.3	Understand the significance of stiffness, and hygrothermal and mechanical response of special cases of laminates.		
2.0	**Skills**		
2.1	Develop fundamental relationships for predicting the mechanical and hygrothermal response of multi layered materials and structures.	Lecture, Problem based learning	• Classwork • 1st Midterm Exams • 2nd Midterm Exams Final Exam:
2.2	Develop micromechanical and macro-mechanical relationships for lamina and laminated materials with emphasis on continuous filament.		
2.3	Establish the failure criteria for laminates based on failure of individual lamina in a laminate.		
2.4	Design a composite material rotating shaft.		
3.0	**Values**		
3.1			
3.2			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Classwork	2 to 14	10
2	1st Midterm Exams	6	20
3	2nd Midterm Exams	11	20
4	Project	2-14	10
5	Final Exam:	Last week	40

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:

The Mechanical Engineering Program (MEP) prioritize the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a supportive learning environment, and to achieve this, they allocate

specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Mechanics of Composite Materials, Autar K. Kaw, CRC Taylor & Francis, (2006).
Essential References Materials	Engineering Mechanics of Composite Materials, Daniel I. M. and Ishai O, Oxford University Press, 2^{nd} Edn., 2006, 978-0195150971, 2 edition (2005).
Electronic Materials	1. Lecture handouts and presentation on blackboard (https://tabuk.blackboard.com/webapps/login/?action=relogin) 2. Interactive Simulations: ● PhET Interactive Simulations (https://phet.colorado.edu/) 3. Online Courses and Lectures: ● Coursera (https://www.coursera.org/) ● edX (https://www.edx.org/) ● Khan Academy (https://www.khanacademy.org/) **4. Educational YouTube Channels:** ● LearnEngineering (https://www.youtube.com/user/LearnEngineering) **Engineering Journals and Databases:** ● ASME: The American Society of Mechanical Engineers (https://www.asme.org/) ● ScienceDirect (https://www.sciencedirect.com/) **5. Virtual Labs:** ● Virtual Lab (http://www.vlab.co.in/) 6. **Engineering Software:** • AutoCAD (https://www.autodesk.com/products/autocad/overview) • SolidWorks (https://www.solidworks.com/) • Fusion 360 (https://www.autodesk.com/products/fusion-360/overview) • MATLAB (https://www.mathworks.com/products/matlab.html) • Python (https://www.python.org/) 7. **Mechanical Engineering Apps:** • Engineering Toolbox (https://www.engineeringtoolbox.com/) • Wolfram Alpha (https://www.wolframalpha.com/) 8. **Discussion Forums:**

	• Engineering Stack Exchange (https://engineering.stackexchange.com/) • Reddit - Mechanical Engineering (https://www.reddit.com/r/MechanicalEngineering/) 9. **Webinars and Conferences:** ASME Events (https://www.asme.org/events)
Other Learning Materials	1. **Lecture Notes and Tutorials:** • MIT OpenCourseWare (https://ocw.mit.edu/index.htm) • LectureNotes (https://lecturenotes.in/) 2. **Technical Blogs and Articles:** • Mechanical Engineering Blog (https://www.engineeringchoice.com/mechanical-engineering-blog/) • ASME's Mechanical Engineering Magazine (https://www.asme.org/topics-resources/society-news/asme-magazine) 3. **Industry Reports and Trends:** • McKinsey & Company - Mechanical Engineering (https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights) • Frost & Sullivan - Mechanical Engineering (https://ww2.frost.com/research/industry/mechanical-electrical/) 4. **Professional Organizations:** • Institution of Mechanical Engineers (IMechE) (https://www.imeche.org/) 5. **Technical Magazines:** • Mechanical Engineering Magazine (https://www.memagazine.org/) • Machine Design Magazine (https://www.machinedesign.com/) 6. **Interactive Learning Platforms:** • Chegg Study (https://www.chegg.com/study) • Quizlet (thttps://quizlet.com/)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms equipped with data show. White Board.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Selected topics in Mechanical Engineering (1)**
Course Code:	**ME490**
Program:	**Bachelor of Science in Mechanical Engineering**
Department:	**Mechanical Engineering**
College:	**Faculty of Engineering**
Institution:	**University of Tabuk**

Table of Contents

A. Course Identification

1. Credit hours: 3								
2. Course type								
a.	University	☐	College	☐	Department	**X**	Others	☐
b.	Required	☐	Elective	**X**				
3. Level/year at which this course is offered: 10/5								
4. Pre-requisites for this course (if any)**:** ME 231								
5. Co-requisites for this course (if any)**:**								

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	60	100%
2	**Blended**	0	0
3	**E-learning**	0	0
4	**Distance learning**	0	0
5	**Other**	0	0

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	30
3	**Tutorial**	0
4	**Others** (specify)	0
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

The course on "Selected Topics in Mechanical Engineering (1)" offers a focused exploration of fundamental concepts in fluid mechanics and their practical applications. Through a series of modules, students delve into fluid flow kinematics, the application of Bernoulli's equation, measurement techniques for pressure, velocity, and flow rate, analysis of pipe flows, dimensional analysis, similitude, and the performance characteristics of various pumps and valves. The aim is to equip students with a deep understanding of fluid behavior, measurement skills, and the ability to analyze and design systems involving fluid flow.

2. Course Main Objective

1. Understanding Fluid Flow Kinematics:
   - Define and explain the fundamental concepts of fluid flow kinematics.

- Analyze the behavior of fluids in motion, including key parameters such as velocity and pressure.

2. Application of Bernoulli's Equation:
   - Demonstrate a thorough understanding of Bernoulli's equation and its application in fluid dynamics.
   - Solve problems related to energy conservation in fluid flow using Bernoulli's equation.
3. Measurement of Pressure, Velocity, and Flow Rate:
   - Acquire practical skills in measuring pressure, velocity, and flow rate in fluid systems.
   - Interpret and analyze measurement data to characterize fluid flow conditions.
4. Analysis of Pipe Flows:
   - Study the characteristics of flow in pipes, including laminar and turbulent flow regimes.
   - Evaluate the factors influencing pressure drop and flow distribution in pipe networks.
5. Dimensional Analysis and Similitude:
   - Apply dimensional analysis techniques to derive dimensionless parameters for fluid flow problems.
   - Understand the concept of similitude and its application in modeling and predicting fluid flow behavior.
6. Performance Characteristics of Centrifugal Pumps:
   - Analyze the performance characteristics of centrifugal pumps, including efficiency, head-flow curves, and operating conditions.
   - Design and evaluate systems incorporating centrifugal pumps.
7. Performance Characteristics of Axial Pumps:
   - Investigate and understand the performance characteristics of axial pumps.
   - Compare and contrast the operation of axial pumps with other pump types.
8. Performance Characteristics of Positive Displacement Pumps:
   - Explore the operational aspects and performance characteristics of positive displacement pumps.
   - Analyze the advantages and limitations of positive displacement pump systems.
9. Valves: Types and Characteristics:
   - Identify and classify different types of valves used in fluid systems.
   - Understand the characteristics and applications of various valve types.

These objectives aim to provide students with a comprehensive understanding of fluid flow kinematics and related topics in mechanical engineering.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Acquire the principles, concepts and theories of fluid mechanics, turbomachinery and pipe lines systems.	K1
1.2	Understand the phenomenon of cavitations and water-hammer problems and fluid machinery noise in turbomachines.	K1

CLOs		Aligned PLOs
1.3		
1...		
2	**Skills :**	
2.1	Solve problems of fluid mechanics, turbomachinery and pipe lines.	S1
2.2	Design fluid mechanics, turbomachinery and pipe lines systems to meet desired needs within realistic constraints .	S2
2.3		
2...		
3	**Values:**	
3.1		
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Introduction to Fluid Mechanics	4
2	Fluid Flow Kinematics	4
3	Bernoulli's Equation	4
4	Pressure, Velocity, and Flow Rate Measurements	4
5	Pipe Flows	4
7	Dimensional Analysis and Similitude	4
8	Performance Characteristics of Centrifugal Pumps	4
9	Performance Characteristics of Axial Pumps	4
10	Performance Characteristics of Positive Displacement Pumps	4
11.	Valves: Types and Characteristics	4
12.	Incompressible Flow in Pipelines	4
13.	Power Transmission by Pipelines	4
14.	Stresses in Pipelines	4
15	Evaluation of Pipeline Layout and Supports	4
Total		60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Acquire the principles, concepts and theories of fluid mechanics, turbomachinery and pipe lines systems.	Lecture	• Classwork • 1st Midterm Exams

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.2	Understand the phenomenon of cavitations and water-hammer problems and fluid machinery noise in turbomachines.		• 2nd Midterm Exams Final Exam:
…			
2.0	**Skills**		
2.1	Solve problems of fluid mechanics, turbomachinery and pipe lines.	Lecture, Problem based learning	• Classwork • 1st Midterm Exams • 2nd Midterm Exams Final Exam:
2.2	Design fluid mechanics, turbomachinery and pipe lines systems to meet desired needs within realistic constraints .		
…			
3.0	**Values**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Classwork	2 to 14	20
2	1st Midterm Exams	6	20
3	2nd Midterm Exams	11	20
5	Final Exam:	Last week	40
6			
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

The Mechanical Engineering Program (MEP) prioritize the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Peng William W, Fundamentals of Turbomachinery, John Wiley & Sons, Inc. 2008.
Essential References Materials	Yahya S. M., Turbines, Compressors & Fans, Tata-McGraw Hill Co., 2nd Edition (2008).
Electronic Materials	1. Lecture handouts and presentation on blackboard (https://tabuk.blackboard.com/webapps/login/?action=relogin) 2. Interactive Simulations: • PhET Interactive Simulations (https://phet.colorado.edu/) 3. Online Courses and Lectures: • Coursera (https://www.coursera.org/) • edX (https://www.edx.org/) • Khan Academy (https://www.khanacademy.org/) **4. Educational YouTube Channels:** • LearnEngineering (https://www.youtube.com/user/LearnEngineering) **Engineering Journals and Databases:** • ASME: The American Society of Mechanical Engineers (https://www.asme.org/) • ScienceDirect (https://www.sciencedirect.com/) **5. Virtual Labs:** • Virtual Lab (http://www.vlab.co.in/) 6. **Engineering Software:** • AutoCAD (https://www.autodesk.com/products/autocad/overview) • SolidWorks (https://www.solidworks.com/) • Fusion 360 (https://www.autodesk.com/products/fusion-360/overview) • MATLAB (https://www.mathworks.com/products/matlab.html) • Python (https://www.python.org/) 7. **Mechanical Engineering Apps:** • Engineering Toolbox (https://www.engineeringtoolbox.com/) • Wolfram Alpha (https://www.wolframalpha.com/) 8. **Discussion Forums:** • Engineering Stack Exchange (https://engineering.stackexchange.com/) • Reddit - Mechanical Engineering (https://www.reddit.com/r/MechanicalEngineering/) 9. **Webinars and Conferences:** ASME Events (https://www.asme.org/events)
Other Learning Materials	1. **Lecture Notes and Tutorials:** • MIT OpenCourseWare (https://ocw.mit.edu/index.htm) • LectureNotes (https://lecturenotes.in/) 2. **Technical Blogs and Articles:** • Mechanical Engineering Blog (https://www.engineeringchoice.com/mechanical-engineering-blog/)

	• ASME's Mechanical Engineering Magazine (https://www.asme.org/topics-resources/society-news/asme-magazine) 3. **Industry Reports and Trends:** • McKinsey & Company - Mechanical Engineering (https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights) • Frost & Sullivan - Mechanical Engineering (https://ww2.frost.com/research/industry/mechanical-electrical/) 4. **Professional Organizations:** • Institution of Mechanical Engineers (IMechE) (https://www.imeche.org/) 5. **Technical Magazines:** • Mechanical Engineering Magazine (https://www.memagazine.org/) • Machine Design Magazine (https://www.machinedesign.com/) 6. **Interactive Learning Platforms:** • Chegg Study (https://www.chegg.com/study) • Quizlet (thttps://quizlet.com/)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms equipped with data show. White Board.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Fluid mechanics and hydraulic Lab

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAA T4 2020

Course Specifications

Course Title:	**Graduation Project 1**
Course Code:	**ME493**
Program:	**Bachelor of Science in Mechanical Engineering**
Department:	**Mechanical Engineering**
College:	**College of Engineering**
Institution:	**University of Tabuk**

Table of Contents

A. Course Identification

1. Credit hours: 2							
2. Course type							
a.	University ☐	College ☐	Department ■	Others ☐			
b.	Required ■	Elective ☐					
3. Level/year at which this course is offered: 10/5							
4. Pre-requisites for this course (if any)**:** ME315, ME315, ME495							
5. Co-requisites for this course (if any)**:** **N.A**							

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	30	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other -meeting with students		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	
3	Tutorial	
4	**Others** (specify) meeting with students	
	Total	30

B. Course Objectives and Learning Outcomes

1. Course Description

Choosing the topic, establishing the project, literature review, preparing for/or preliminary conducting the experiments, collecting the field data and developing the mathematical/ computer model if applicable, writing the first two chapters along with any preliminary findings

a) Project Group (PG)
A group of 3 to 5 students working together on the graduation project is called Project Group or PG.
b) Project Committee (CPC)
A committee called Capstone Project Committee is formed by the department which is in charge of all Graduation Projects (GPs) and ensures that the prescribed procedures are properly implemented for all projects. Members of CPC are appointed at the beginning of every academic year. CPC's main duty is to ensure that the following requirements in each GP proposal are satisfied:
[a] It is a design problem that has several possible solutions and realistic constraints.
[b] Project objectives are well defined and clearly stated without ambiguity.
[c] The project objectives are achievable within a maximum of two semesters.
[d] The project can give the students opportunity to demonstrate the required SOs.
[e] The project is based on courses and is not a research project.
[f] The project selected has not been done in past years.
c) Supervisor
Supervisor is a faculty member who coordinates a Graduation Project, advises the project team and is responsible for reporting the assessment data.

2. Course Main Objective

1. Analyze a project statement, brief, or proposal to identify the real problem and the most relevant needs and realistic constraints.
2. Identify potential customers, their needs, and their operational constraints.
3. Collect an effective literature survey and be able to contrast and critique related work and review
4. Integrate previous knowledge from mathematics, basic sciences, engineering fundamentals and discipline related courses to address the problem.
5. Discuss all applicable realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
6. Define design objectives, design constraints, measures of design viability, and the evaluation criteria of the final project, and reformulate the problem based on collected data.
7. Generate possible solutions; compare alternatives, and select one alternative based on evaluation criteria and feasibility analysis.
8. Plan an effective design strategy and a project work plan, using standard project planning techniques, to ensure project completion on time and within budget.
9. Demonstrate Knowledge of contemporary issues

Demonstrate his ability to work independently and as part of a team with colleagues and advisors utilizing good work dynamics.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	An ability to demonstrate knowledge of concepts of mechanical engineering and science	K1
1...		
2	**Skills :**	
2.1	An ability to identify, formulate, and solve complex engineering problems by applying principles of mechanical engineering, science, and mathematics.	S1
2.2	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	S2
2.3	An ability to communicate effectively with a range of audiences	S4
2.4		
3	**Values:**	
3.1	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	V1
3.2	An ability to function effectively on a team, whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	V2
3.3	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	V3

C. Course Content

No	List of Topics	Contact Hours
1	Introduction to Project Management in Mechanical Engineering	2
2	Problem Formulation and Identifying Engineering Challenges	2
3	Sustainability and Environmental Considerations in Engineering Projects	2
4	Data Collection and Experimental Design for Engineering Projects	2
5	Ethical Considerations in Engineering Projects	2
6	Collaborative Teamwork and Leadership Skills for Project Success	2
7	Effective Communication in Engineering Projects	2
8	Risk Assessment and Management in Engineering Projects	2
9.	Project Proposal and Scope Development	2
10.	Research Methods and Literature Review Techniques	2
11.	Design Thinking and Engineering Problem-Solving	2
12.	Global, Economic, and Societal Impact of Engineering Solutions	2
13.	Project Report Writing	2

14.	Project Report Writing	2
15	Presentation Skills	2
Total		30

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	An ability to demonstrate knowledge of concepts of mechanical engineering and science	Lecture Project based learning	SDP Activities Final Report Presentation Project Findings
1.2			
…			
2.0	**Skills**		
2.1	An ability to identify, formulate, and solve complex engineering problems by applying principles of mechanical engineering, science, and mathematics.	Lecture Project based learning	SDP Activities Final Report Project Findings
2.2	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	Lecture Project based learning	SDP Activities Final Report Presentation Project Findings
2.3			
2.4	An ability to communicate effectively with a range of audiences	Project-based learning	Final Report Presentation
3.0	**Values**		
3.1			
3.2	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	Project-based learning	SDP Activities Final Report
3.3	An ability to function effectively on a team, whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	Project-based learning	SDP Activities
3.4	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	Project-based learning	SDP Activities Final Report Presentation
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	SDP activities	2 to 15	60 %
2	Final report/ presentation	Last week	40 %
3			
4			
5			
6			
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice : The Mechanical Engineering Program (MEP) prioritize the availability of MEP esteemed faculty and teaching staff to ensure that students have ample opportunities for individual consultations and academic advice. MEP faculty members are dedicated to fostering a supportive learning environment, and to achieve this, they allocate specific time slots for one-on-one consultations with students. These sessions serve as valuable forums for discussing coursework, addressing academic queries, and providing personalized guidance. Additionally, MEP faculty is committed to staying accessible through various communication channels, including virtual platforms, to accommodate the diverse needs and schedules of MEP students. This proactive approach reflects MEP commitment to nurturing a collaborative and enriching educational experience within the Mechanical Engineering Program.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	"Engineering Ethics: Concepts and Cases" by Charles E. Harris Jr., Michael S. Pritchard, and Michael J. Rabins "Shigley's Mechanical Engineering Design" by Richard G. Budynas and Keith J. Nisbett "Mechanics of Materials" by Russell C. Hibbeler "Thermodynamics: An Engineering Approach" by Yunus A. Cengel and Michael A. Boles "Fundamentals of Fluid Mechanics" by Bruce R. Munson, Donald F. Young, and Theodore H. Okiishi
Essential References Materials	"Engineering Ethics" by Govind R. Srivastava "Materials Science and Engineering: An Introduction" by William D. Callister Jr. and David G. Rethwisch
Electronic Materials	American Society of Mechanical Engineers (ASME): Website: https://www.asme.org/ Mechanical Engineering Magazine: Website: https://www.memagazine.org/ Engineering Toolbox:

	Website: https://www.engineeringtoolbox.com/ MIT OpenCourseWare - Mechanical Engineering: Website: https://ocw.mit.edu/courses/mechanical-engineering/
Other Learning Materials	"Shigley's Mechanical Engineering Design" by Richard G. Budynas and Keith J. Nisbett: A comprehensive guide to mechanical design principles. "Mechanics of Materials" by Russell C. Hibbeler: Focuses on the mechanics of materials and their applications. "Thermodynamics: An Engineering Approach" by Yunus A. Cengel and Michael A. Boles: A textbook covering thermodynamics and heat transfer. "Introduction to Finite Elements in Engineering" by Tirupathi R. Chandrupatla and Ashok D. Belegundu: Introduces finite element analysis techniques.

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms Laboratories and workshops exhibition rooms simulation rooms,
Technology Resources (AV, data show, Smart Board, software, etc.)	Equipped with audiovisual aids - Display boards and presentation equipment - High-quality projectors for presentations - Computers with simulation software
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Raw material and manufacturing tools

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAA
T4
2020

Course Specifications

Course Title:	**Graduation project II**
Course Code:	**ME494**
Program:	**Bachelor of Science in Mechanical Engineering**
Department:	**Mechanical Engineering**
College:	**Faculty of Engineering**
Institution:	**University of Tabuk**

Table of Contents

A. Course Identification

1. Credit hours: 3	
2. Course type	
a. University ☐ College ☐ Department ☒ Others ☐	
b. Required ☒ Elective ☐	
3. Level/year at which this course is offered: 10/5	
4. Pre-requisites for this course (if any)**:** ME493	
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**		
2	**Blended**	90	100%
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	
2	**Laboratory/Studio**	90
3	**Tutorial**	
4	**Others** (specify)	
	Total	90

B. Course Objectives and Learning Outcomes

1. Course Description

Choosing the topic, establishing the project, literature review, preparing for/or preliminary conducting the experiments, collecting the field data and developing the mathematical/ computer model if applicable, writing the first two chapters along with any preliminary findings

2. Course Main Objective

1. Analyze a project statement, brief, or proposal to identify the real problem and the most relevant needs and realistic constraints.
2. Identify potential customers, their needs, and their operational constraints.
3. Collect an effective literature survey and be able to contrast and critique related work and review
4. Integrate previous knowledge from mathematics, basic sciences, engineering fundamentals and discipline related courses to address the problem.
5. Discuss all applicable realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

6. Define design objectives, design constraints, measures of design viability, and the evaluation criteria of the final project, and reformulate the problem based on collected data.
7. Generate possible solutions; compare alternatives, and select one alternative based on evaluation criteria and feasibility analysis.
8. Plan an effective design strategy and a project work plan, using standard project planning techniques, to ensure project completion on time and within budget.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	An ability to demonstrate knowledge of concepts of mechanical engineering and science	K1
1.5		
2	**Skills :**	
2.1	An ability to identify, formulate, and solve complex engineering problems by applying principles of mechanical engineering, science, and mathematics.	S1
2.2	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	S2
2.3	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions	S3
2...	An ability to communicate effectively with a range of audiences	S4
3	**Values:**	
3.1	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	V1
3.2	An ability to function effectively on a team, whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	V2
3.3	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	V3
3...		

C. Course Content

No	List of Topics	Contact Hours
1.	Project Timeline Management:	6
2.	Ethical and professional responsibilities in engineering	6
3.	Literature Review for Experimental Design:	6
4.	Design Methodology, Synthesis, Creativity and Conceptualization	6
5.	Prototype Design and Development:	6
6.	Risk Assessment and Mitigation:	6
7.	Materials Selection and Testing:	6
8.	Data Analysis Techniques:	6
9.	Experimental Setup and Methodology:	6
10.	Instrumentation and Data Acquisition:	6
11.	Team Work Skills	6

12.	Use of standards and design codes	6
13.	Report Writing Guidelines:	6
14.	Poster Presentation Skills:	6
15.	Final Project Report Compilation:	6
	Total	90

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	An ability to demonstrate knowledge of concepts of mechanical engineering and science	Lecture Project based learning	Project Report & Presentation
1.2			
2.0			
2.1	An ability to identify, formulate, and solve complex engineering problems by applying principles of mechanical engineering, science, and mathematics.	Experimental based learning	Project Report & Presentation Prototype
2.2	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	Project based learning	
	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions	Experimental based learning	Prototype
	An ability to communicate effectively with a range of audiences	Lecture, Problem based learning	• Weekly follow ups with the teams by College faculty supervisor. • Final report and presentation to assess professional skills
3.1	An ability to communicate effectively with a range of audiences	Lecture, Problem based learning	• Weekly follow ups with the teams by College faculty supervisor. • Final report and presentation to assess professional skills
3.2	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.		
	An ability to function effectively on a team, whose members together provide leadership, create a collaborative and	Project based learning	

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	inclusive environment, establish goals, plan tasks, and meet objectives.		
	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	Project based learning	Project Report & Presentation

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Project based learning	Weekly follow up	30
2	Prototype	16	20
	GP final report	16	20
	GP presentation	16	20

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

-Four office hours per week are offered by the instructor to aid the students and support them

-Communicate by email.

-Interact and communicate through the Blackboard

Individual Academic Advising:

- Provide one-on-one academic advising sessions to discuss individual student progress, address concerns, and set academic goals.

Feedback Mechanism:

- Establish a feedback mechanism for students to express concerns, provide suggestions, and communicate any issues related to the course.

Online Learning Resources:

- Curate a list of online resources, tutorials, and forums where students can seek additional help and clarification on course concepts.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	ME Books, lecture notes, internet, etc.
Essential References Materials	ME Books, lecture notes, internet, etc.
Electronic Materials	1. **Engineering Software:** • AutoCAD (https://www.autodesk.com/products/autocad/overview) • SolidWorks (https://www.solidworks.com/) • Fusion 360 (https://www.autodesk.com/products/fusion-360/overview) • MATLAB (https://www.mathworks.com/products/matlab.html) • Python (https://www.python.org/)

	2. **Mechanical Engineering Apps:** • Engineering Toolbox (https://www.engineeringtoolbox.com/) • Wolfram Alpha (https://www.wolframalpha.com/) 3. **Discussion Forums:** • Engineering Stack Exchange (https://engineering.stackexchange.com/) • Reddit - Mechanical Engineering (https://www.reddit.com/r/MechanicalEngineering/)
Other Learning Materials	1. **Lecture Notes and Tutorials:** • MIT OpenCourseWare (https://ocw.mit.edu/index.htm) • LectureNotes (https://lecturenotes.in/) 2. **Technical Blogs and Articles:** • Mechanical Engineering Blog (https://www.engineeringchoice.com/mechanical-engineering-blog/)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Lecture room
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show, Black board e-learning
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	workshops

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resource	Students Head of the department	Online survey Class visit
Effectiveness of students assessment	Students Head of the department	Online survey Direct results analysis (Course Excel sheet)
Effectiveness of teaching	Students	Online survey
The extent to which CLOs have been achieved	Instructor	Direct exam results analysis (Course Excel sheet)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA
T5
2019

Field Experience Specifications

Course Title:	**Practical Training**
Course Code:	**ME495**
Program:	**Bachelor of Science in Mechanical Engineering**
Department:	**Mechanical Engineering**
College:	**Faculty of Engineering**
Institution:	**University of Tabuk**

Table of Contents

A. Field Experience Identification

1. Credit hours: 2
2. Level/year at which this course is offered:8/4
3. Dates and times allocation of field experience activities. ● Number of weeks: (8) week ● Number of days: (40) day ● Number of hours: (240) hour
4. Pre-requisites to join field experience (if any)**:** Department approval

B. Learning Outcomes, and Training and Assessment Methods

1. Field Experience Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Use different types of instruments for calibration, data collection, monitoring of Mechanical devices, processes, or systems	K1
1.2		
1.3		
1.4		
1.5		
1.6		
2	**Skills:**	
2.1	Apply practically the fundamental knowledge of Mechanical Engineering	S1
2.2	Share the field experience with a technical seminar presentation and a written report	S4
2.3		
3	**Values:**	
3.1	Identify and explain the impact of engineering solutions in a global, economic, environmental, and societal context	V1
3.2	Identify and explain professional and ethical responsibilities	V1
3.3	Utilize concepts and methods in Mechanical Engineering to participate in tackling problems in different areas of field work	V2
3.4.	Acquire a good deal of field experience to supplement current knowledge towards future career	V3
3.5	Gain knowledge of contemporary issues	V3

2.Alignment of Learning Outcomes with Training Activities and Assessment Methods

Code	Learning Outcomes	Training Methods/Activities	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Use different types of instruments for calibration, data collection,		

Code	Learning Outcomes	Training Methods/Activities	Assessment Methods
	monitoring of Mechanical devices, processes, or systems	Regular attendance at training locations. Actively participating in different work tasks at the training location and linking them to theory.	Weekly reports from training organization. The overall assessment report of the training organization.
1.2			
1.3			
1.4			
1.5			
1.6			
2.0	**Skills**		
2.1	Apply practically the fundamental knowledge of Mechanical Engineering	Attending and/or receiving safety orientation by the training organization.	Final report submitted by the student. Practical training assessment interview.
2.2	Share the field experience with a technical seminar presentation and a written report	Produce a comprehensive informative report on the different aspects of field training.	Final report submitted by the student.
3.0	**Values**		
3.1	Identify and explain the impact of engineering solutions in a global, economic, environmental, and societal context		
3.2	Identify and explain professional and ethical responsibilities	Recognition and compliance with ethical codes and standards as practiced in the training location and/or within the training organization.	The overall assessment report of the training organization. Practical training assessment interview.
3.3	Utilize concepts and methods in Mechanical Engineering to participate in tackling problems in different areas of field work	Attending and/or receiving safety orientation by the training organization.	Final report submitted by the student. Practical training assessment interview.
3.4	Acquire a good deal of field experience to supplement current knowledge towards future career	Perform the tasks assigned by the direct supervisor.	The overall assessment report of the training organization.
3.5	Gain knowledge of contemporary issues	Effective participation and involvement in	The overall assessment report

Code	Learning Outcomes	Training Methods/Activities	Assessment Methods
		relevant tasks at the training location	of the training organization. Practical training assessment interview.

3. Field Experience Learning Outcomes Assessment

a. Students Assessment Timetable

#	Assessment task*	Assessment timing (Week)	Percentage of Total Assessment Score
3	Final report prepared by the student.	Beginning of semester	20%
4	Power point presentation for the training and discussion.	Beginning of semester	30 %
5	Company evaluation.	Weekly	30%
6			
7			
8			

***Assessment task** (i.e., Practical test, oral test, presentation, group project, essay, etc.)

b. Assessment Responsibilities

م	Category	Assessment Responsibility
1	**Teaching Staff**	**Dr. Mohamed Al Swat**
2	**Field Supervisor**	
3	**Others** (specify)	

C. Field Experience Administration

1. Field Experience Locations

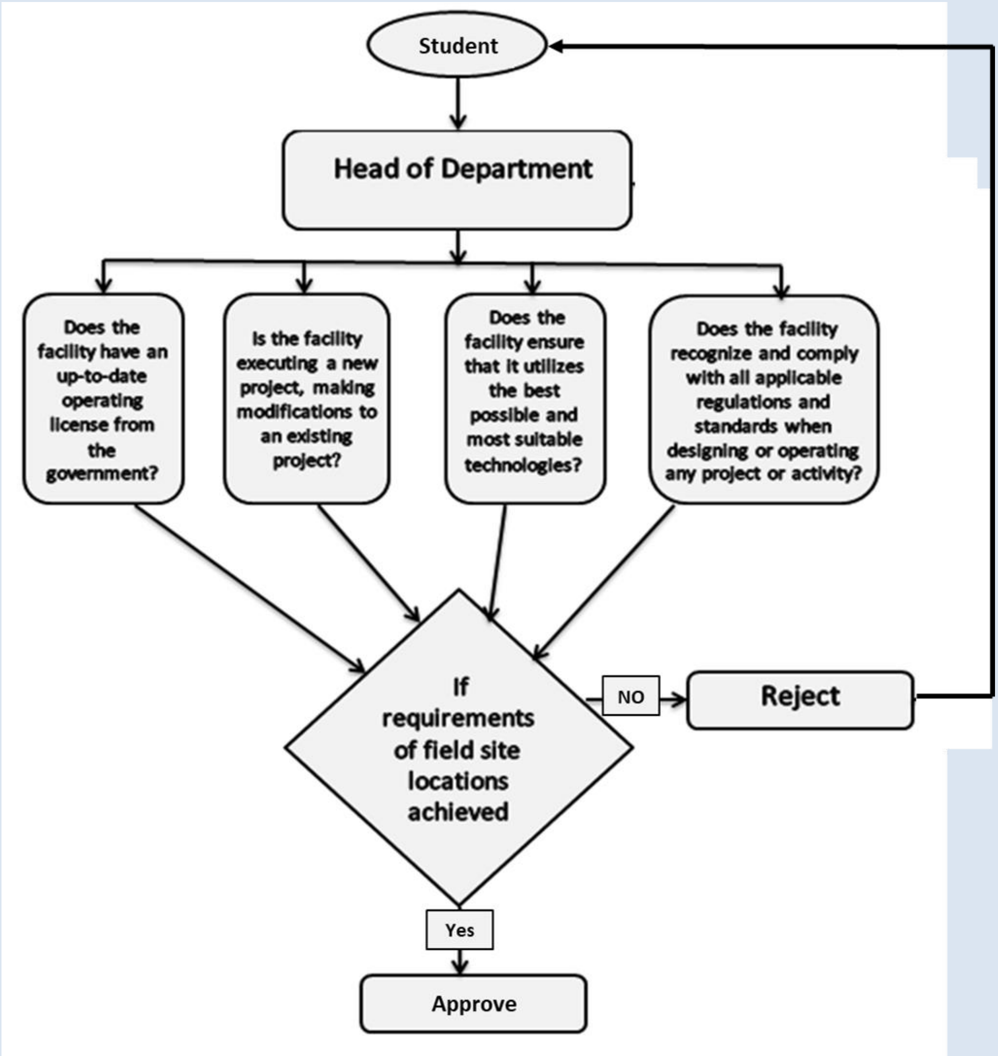
a. Field Experience Locations Requirements

Suggested Field Experience Locations	General Requirements*	Special Requirements**
Tabuk Air Port	• Provides practical experience in one or more disciplines of FE programs. • Assures active participation of students in relevant activities at the training location. Provides needed support to students	• Training activities must be complementary to the knowledge body in the study plan. **Preferably** provides training and/or orientation on modern trends, software, and technologies.

	throughout their training experience	
NEOM		
Desalination stations		
Power stations		

*Ex: provides information technology, equipment, laboratories, halls, housing, learning sources, clinics etc.
**Ex: Criteria of the training institution or related to the specialization, such as: safety standards, dealing with patients in medical specialties, etc.

b. Decision-making procedures for identifying appropriate locations for field experience



2. Supervisory Staff

a. Selection of Supervisory Staff

Selection Items	Field Supervisor	Teaching Staff
Qualifications		PhD
Selection Criteria		

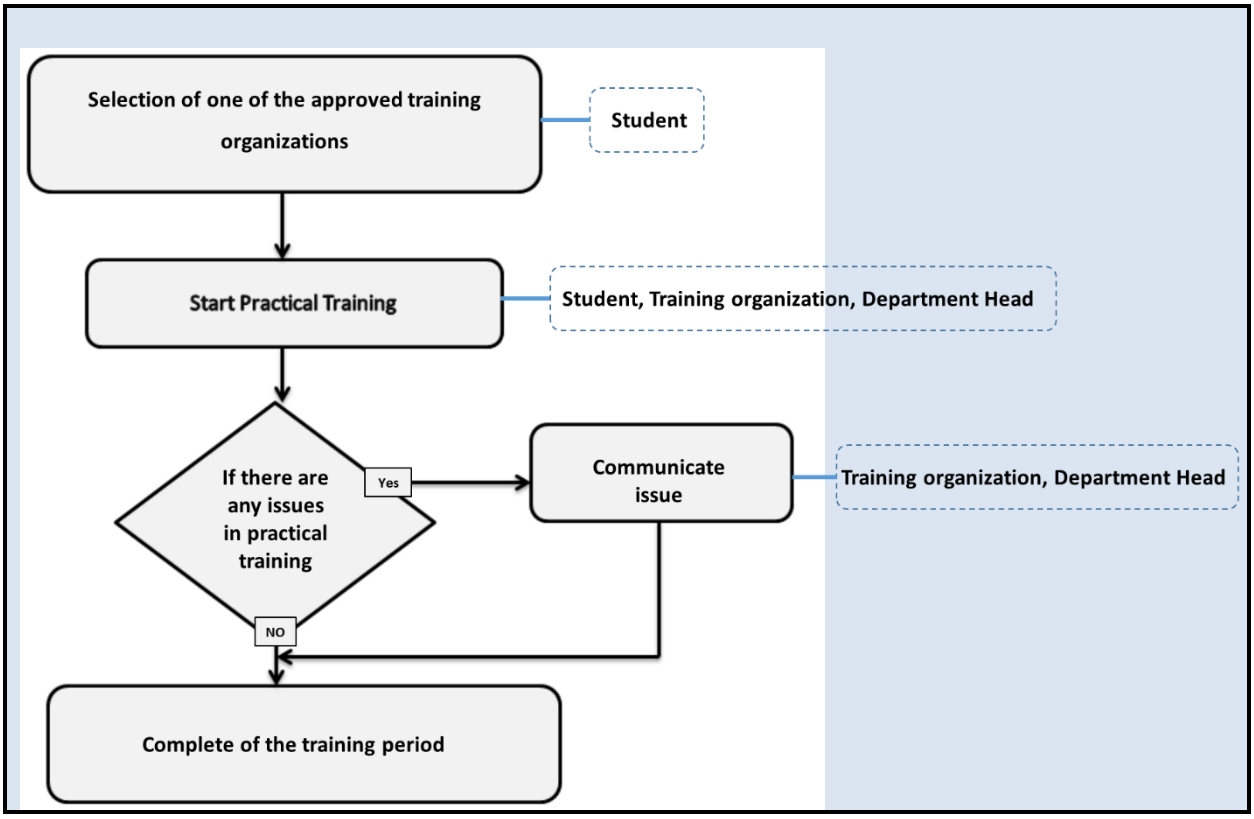
b. Qualification and Training of Supervisory Staff

(Including the procedures and activities used to qualify and train the supervisory staff on supervising operations, implementing training activities, the follow-up and evaluation of students, etc.)

3. Responsibilities

a. Field Experience Flowchart for Responsibility

including units, departments, and committees responsible for field experience, as evidenced by the relations between them.



b. Distribution of Responsibilities for Field Experience Activities

Activity	Department or College	Teaching Staff	Student	Training Organization	Field Supervisor
Selection of a field experience site	✓	✓	✓	✓	-
Selection of supervisory staff	✓	✓	-	✓	✓
Provision of the required equipment	-	-	-	✓	✓
Provision of learning resources	✓	✓	-	✓	✓
Ensuring the safety of the site	-	✓	-	✓	✓
Commuting to and from the field experience site	-	-	✓	✓	✓
Provision of support and guidance	✓	✓	-	✓	✓

Activity	Department or College	Teaching Staff	Student	Training Organization	Field Supervisor
Implementation of training activities (duties, reports, projects, …..)	-	-	✓	✓	✓
Follow up on student training activities	-	✓	-	✓	✓
Adjusting attendance and leave	-	-	-	✓	✓
Assessment of learning outcomes	✓	✓	-	✓	✓
Evaluating the quality of field experience	✓	✓	✓	✓	✓
Others (specify)					

4. Field Experience Implementation

a. Supervision and Follow-up Mechanism

b. Student Support and Guidance Activities

5. Safety and Risk Management

Potential Risks	Safety Actions	Risk Management Procedures
The expulsion of training without compelling reasons	Contract an agreement with the company/organization.	Select companies/organizations with an agreement in advance.
Injury to the trainee during training.	Contract an agreement with the company/organization.	Select companies/organizations with an agreement in advance.
Claim the college with the financial receivables.	Contract an agreement with the company/organization.	Select companies/organizations with an agreement in advance.

G. Training Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of Training and Assessment.	Students	Direct (online survey)
Extent of achievement of course learning outcomes.	Students	Indirect (CLOs survey)
Extent of achievement of course learning outcomes.	Teaching staff	Direct (oral presentation)

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Quality of learning resources.	Student	Indirect (online survey)

Evaluation areas (e.g., Effectiveness of Training and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Supervisory Staff, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

E. Specification Approval Data

Council / Committee	ME council
Reference No.	ME council No.3,1443/02/12
Date	12/02/1443

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA
T4
2020

Course Specifications

Course Title:	General Physics
Course Code:	PHYS101
Program:	**Physics/PHYS**
Department:	**Physics**
College:	**Faculty of Sciences**
Institution:	**University of Tabuk**

Table of Contents

A. Course Identification

1. Credit hours: 3	
2. Course type	
a. University √ College ☐ Department ☐ Others ☐	
b. Required √ Elective ☐	
3. Level/year at which this course is offered: **2nd level/1st year**	
4. Pre-requisites for this course (if any)**: None**	
5. Co-requisites for this course (if any)**: None**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other (Laboratory)		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	45
2	Laboratory/Studio	
3	Tutorial	
4	Others	
	Total	45

B. Course Objectives and Learning Outcomes

1. Course Description: Explore the physical underpinnings of our universe, the basic principles of physical laws, their application to the behavior of objects, and how we use the scientific method to advance our knowledge
2. Course Main Objective: The main objective of this course is to learn the basic laws of mechanics specially Newton's First Law, 2nd Law and 3rd Laws of Motion. Their use how to tackle the problems of day to day life, using these laws. Students should also learn here what causes motion or equilibrium of the object and the types of forces responsible for it. Apart from this, the objective of this course module is: students should learn the technique to solve the problems using Laws of Conservation of Energy, Conservation of linear Momentum and conservation of Angular Momentum.

3. Course Learning Outcomes

	CLOs	Aligned-PLOs
1	**Knowledge and Understanding:**	
1.1	- Describe basic laws and principles of physics theorems.	K1
2	**Skills :**	
2.1	- Calculate the solution of basic physics problems..	S1
3	**Values:**	

C. Course Content

No	List of Topics	Contact Hours
1	Review and introduction	3
2	Physical quantities – The SI units – Changing units – Fundamental quantities (length, mass and time)	3
3	Vectors (vectors and scalars – adding vectors geometrically – components of vectors – unit vector - adding vectors)	6
4	Position and displacement - Average velocity and average speed- Acceleration - Free-Fall acceleration	3

5	(Position and displacement – velocity – accelerations) in II & III dimensions - projectile	6
6	Types of forces, Net force, Newton's laws	6
7	Ropes and Pulleys, Applying Newton's laws	6
8	Kinetic energy, work, Work-Kinetic energy theory, power	2
9	Potential energy Conservation and non-conservation forces	2
10	Work and potential energy Conservation of mechanical energy	2
11	Linear momentum Impulse	3
12	Conservation of linear momentum-elastic collisions	3
13	Revision	3
Total		**45**

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	- Describe basic laws and principles of physics theorems.	Lecturing- discussion	Quizzes- class discussion - written exam - assignments
2.0	**Skills**		
2.1	- Calculate the solution of basic physics problems..	Lecturing - solving problems - discussion	Quizzes- class discussion - written exam - assignments
3.0	**Values**		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Midterm 1 exam	5	25%
2	Midterm 2 exam	9	25%
3	Quizzes + assignments + class discussion	1-9	10%
4	Final exam	End of term	40%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice: - Weekly office hours (1 hour per week). - Exam error analysis in class. - Feedback for each student. - Consultations and academic advice by appointment and through e-mail and blackboard.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	- Physics for Global Scientists and Engineers – Volume 1–2ND Edition 2017- Serway- Jewett- Wilson – Rowlands - Fundamental of Physics, by Halliday & Resnick, 11th edition (2018), John Wiley & Sons
Essential References Materials	- Fundamentals of Physics-12th Edition –Jearl Walker(2021) - An introduction to Physical Science 15th Edition (2020) - Shipman-Wilson-Higgins-Torres.
Electronic Materials	http://hdl.handle.net/2237/24065
Other Learning Materials	None

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	- Classrooms ready and equipped with educational media.
Technology Resources (AV, data show, Smart Board, software, etc.)	- Lecture room equipped with an overhead projector, computer, and internet connection. - Blackboard. - Access to Saudi Digital Library Electronic Resource.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	- Library in the Department. - Laboratories for teaching and Research Laboratories.

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Leadership	Students, graduates, faculty Staff, administrative staff, employers	Surveys
Effectiveness of teaching	Students, graduates, program leaders	Surveys, visits

Evaluation Areas/Issues	Evaluators	Evaluation Methods
learning resources	Students, graduates, faculty Staff	Surveys

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	[illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]
Reference No.	
Date	25/2/2022

رئيس قسم الفيزياء

د. صالح أحمد الغامدي

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAA
T4
2020

Course Specifications

Course Title:	**General Physics**
Course Code:	**PHYS 0281**
Program:	**Bachelor Degree**
Department:	**physics**
College:	**science**
Institution:	**University of Tabuk**

Table of Contents

A. Course Identification

1. Credit hours: (1 Lab)	
2. Course type	
a. University ☐ College ☐ Department ☒ Others ☐	
b. Required ☐ Elective ☐	
3. Level/year at which this course is offered: level 3	
4. Pre-requisites for this course (if any)**:MATH101** and **PHYS101**	
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom		
2	Blended		
3	E-learning		
4	Distance learning		
5	Other	2 H	100 %

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	
2	Laboratory/Studio	20 H
3	Tutorial	
4	Others (specify)	
	Total	

B. Course Objectives and Learning Outcomes

1. Course Description

This course is an introductory course for the fundamental principles of physics in mechanics. The student will be studying the main concepts of: Mechanics, dynamics, gravitation, energy, momentum and fluid dynamic

2. Course Main Objective

1- -Provides students with the essential knowledge and understanding of the phenomenon involved in Equilibrium, wave motion and oscillation
2- 2- -Understand the laws of oscillatory motion and learn how to apply them to simple mechanical systems
3- -Understand the equations of fluid mechanics to intuitive concepts.
4- Learn how to translate elastic physical problems into the equations which describe them; solve these equations for the variables describing the problems: and interpret the results to describe the resulting behavior of the elastic physical systems

-To know the concepts and phenomenon in the fields of acoustics

3. Course Learning Outcomes

	CLOs	AlignedPLOs
1	**Knowledge and Understanding**	
1.1	To describe the basic principles of mechanics, dynamics, energy, and momentum.	K1
1.2	To apply the formulas learned to solve the different applications of the related our lives	K2
2	**Skills :**	
2.1	- Apply kinematic formulas to the solution of theoretical and practical physical problems.	S1
2.2	- Analyze the methods to solve a problem and judge which are the best for solving a problem.	S2
2.3	- Organizing research reports using a structured process of inquiry and scientifically-based research.	S3
2...		
3	**Values:**	
3.1	- Actively participate in a wide range of scientific tasks, duties and joint work.	V1

C. Course Content

No	List of Topics	Contact Hours
1	Fine Measurements I	2
2	Fine Measurements II	2
3	Hooke's Law; Expansion of a spring	2
4	The Simple Pendulum	2
5	Static Friction	2
6	Free Fall motion	2
7	The Force Table	2
8	Angled Projection	2
9	Newton's second Law	2
10	Review over all	2
Total		20

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	To describe the basic principles of mechanics, dynamics, energy, and momentum.	Lecturing- discussion-tutorial	Quizzes- class discussion - written exam - assignments
1.2	To apply the formulas learned to solve the different applications of the related our lives	Lecturing- discussion-tutorial	Quizzes- class discussion - written exam - assignments

2.0	**Skills**		
2.1	- Apply kinematic formuls to the solution of theoretical and practical physical problems.	Lecturing - solving problems - discussion	Quizzes- class discussion - written exam - assignments
2.2	- Analyze the methods to solve a problem and judge which are the best for solving a problem.	Lecturing - solving problems - discussion	Quizzes- class discussion - written exam - assignments
…	- Organizing research reports using a structured process of inquiry and scientifically-based research.	Lecturing - project work - solving problems - discussion - lab work	Quizzes- class discussion - written exam - assignments- lab report
3.0	**Values**		
3.1	- Actively participate in a wide range of scientific tasks, duties and joint work.	Solving problems - discussion - presentation	Lab reports - class discussion – project - presentation -

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	**Home works and Assignments**	**Weekly basis**	**10%**
2	**First mid-term exam**	**4th week**	**25%**
3	**Lab exam**	**8th week**	**25%**
4	**Final Exam**	**At End of the Semester**	**40%**

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice

- Weekly office hours (1 hour per week).
- Exam error analysis in class.
- Feedback for each student.
- Consultations and academic advice by appointment and through e-mail and blackboard.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Physics for scientists and engineers; Raymond A. Serway and John W. Jewett; Cengage Learning; 9th edition; (2013).
Essential References Materials	· Physics; John D. Cutnell and Kenneth W. Johnson; John Wiley & Sons; 9th edition; (2012). · College Physics; Raymond A. Serway and Chris Vuille; Cengage Learning; 9th edition; (2011)
Electronic Materials	https://demonstrations.wolfram.com/ https://www.wvwsd.org/Page/92
Other Learning Materials	.Data show and internet- Computer and microphone in smart lecture rooms-

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	classroom required laboratory with the capacity of maximum 12 students is .required (available)
Technology Resources (AV, data show, Smart Board, software, etc.)	Projector available Online learning blackboard
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
External	External examiner	Visit the department and classes
Course report	Department and accreditation visitors	Review the course report
Teacher Evaluation	Students	Online questioner/survey

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods(Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	20/11/2021

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAA

T4 2020

Course Specifications

Course Title:	**General Physics**
Course Code:	**PHY 205**
Program:	**Bachelor Degree**
Department:	**physics**
College:	**science**
Institution:	**University of Tabuk**

Table of Contents

A. Course Identification

1. Credit hours:	(4 Lectures, 1 Lab)
2. Course type	
a. University ☐ College ☐ Department ☒ Others ☐	
b. Required ☐ Elective ☐	
3. Level/year at which this course is offered:	level 3
4. Pre-requisites for this course (if any)**: PHYS 101**and **MATH 101**	
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	4 H	80 %
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**	1 H	20 %

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	40 H
2	**Laboratory/Studio**	10 H
3	**Tutorial**	
4	**Others** (specify)	
	Total	

B. Course Objectives and Learning Outcomes

1. Course Description

The course has been designed to explain the basic principles of vectors and electricity. The student realizes, at the beginning, the meaning of the electric charges and their reaction with each other as well as their effect on the surrounding space throughout their electric field. After that, the electric potential, due to the electric field, and the electric stored energy in the capacitors are introduced to connect the topic of electricity with other topics in Engineering courses. Furthermore, the concept of the direct current and the electric energy consumption are introduced; accordingly, the student will be able to understand how to calculate the cost of the electricity bill. Therefore, the students connect the concepts with the reality.

2. Course Main Objective
The course enables the students to understand the principles of vectors and electricity

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	describe the basic principles of electricity.	K1
1.2	Recognize the formulas learned for different applications of the related topics.	K2
2	**Skills :**	
2.1	Solve problems related to electrical field, electrical potential, electrical potential energy, series and parallel capacitors/resistors, equivalent capacitance/resistance, and dissipation power.	S1
2.2	Apply various models and methods of solutions	S2
2.3	Organize experiments reports in a scientific formalizm	S3
3	**Values:**	
3.1	- Participate in a wide range of scientific tasks, duties and joint work.	V1
3.2	- Demonstrate academic values and ethical code of conduct.	V2

C. Course Content

No	List of Topics	Contact Hours
1	Vector Analysis	4
2	Static electricity, properties of charges.	4
3	Electric Charges: Coulomb's law.	4
4	Electric Field: Definition, unit, electrical field due to a point charge, dipole, electric field of a dipole.	4
5	Gauss Law: Electric flux, closed surface, solving problems.	4
6	Electric Potential: Electric potential energy, units, equipotential surfaces, potential due to a point charge, potential due to a group of point charges.	4
7	Electric Potential: potential due to an electric dipole, potential due to a continuous charge distribution, potential energy of a system of charged particles.	4
8	Capacitance: Capacitance, charging a capacitor, plan capacitor, cylindrical capacitors, spherical capacitor, capacitors in parallel, capacitors in series, energy density.	4
9	Electrical current and resistance: Electrical current, conservation of charges, current density, resistance and resistivity, ohm's law, power in electric circuits.	4
10	Review over all	4
Total		40

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	describe the basic principles of electricity.	Lecture/e-lecture Discussion	

1.2	Recognize the formulas learned for different applications of the related topics.	Problem-Solving Laboratory	Exams Assignments Participation Lap Report
2.0	**Skills**		
2.1	Solve problems related to electrical field, electrical potential, electrical potential energy, series and parallel capacitors/resistors, equivalent capacitance/resistance, and dissipation power.	Lecture/e-lecture Discussion Problem-Solving Laboratory	Exams Assignments Participation Lap Report
2.2	Apply various models and methods of solutions		
…	Organize experiments reports in a scientific formalizm		
3.0	**Values**		
3.1	- Participate in a wide range of scientific tasks, duties and joint work.	Lecture/e-lecture Discussion Problem-Solving Laboratory	Exams Assignments Participation Lap Report
3.2	- Demonstrate academic values and ethical code of conduct.		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	**Home works and Assignments**	**Weekly basis**	**10%**
2	**First mid-term exam**	**4 th week**	**25%**
3	**Lab exam**	**8 th week**	**25%**
4	**Final Exam**	**At End of the Semester**	**40%**

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice : 6 hours per week

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	**Fundamental of Physics, by Halliday & Resnick, 9th edition (2010), John Wiley & Sons.**
Essential References Materials	

Electronic Materials	http://electronics.wisc-online.com/
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	·Adequate class rooms with well-equipped facilities for power presentations and well as very nice white boards available perfectly in each classroom. · Lecture room equipped with blackboard, overhead projector, computer, and internet connection. · Library (SDL facility also available)
Technology Resources (AV, data show, Smart Board, software, etc.)	
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
External	External examiner	Visit the department and classes
Course report	Department and accreditation visitors	Review the course report
Teacher Evaluation	Students	Online questioner/survey

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	20/11/2021