55.Course Specification of Industrial Training

I.Course Identification and General Information:

.1	Course Title:	Industrial Training.				
.2	Course Code & Number:	MT407.				
.3	Credit Hours:	C.H.				TOTAL CR. HRS.
		Th.	Seminar	Pr.	Tu.	
		1	-	4	-	3
.4	Study Level/ Semester at which this Course is offered:	Fifth Year -Second Semester.				
.5	Pre –Requisite (if any):	The students who already have completed a minimum of 150 credit hours just before the commencement of the training. More explicitly, the students can only undergo the training after completion the fourth year.				
.6	Co –Requisite (if any):	None.				
7.	Program (s) in which the Course is offered:	Mechatronics Engineering Program.				
.8	Language of Teaching the Course:	English Language.				
.9	Name of Faculty members who are responsible for administration of the field training:	Assoc. Prof. Dr. Abdul-Malik Ebrahim Momin. Asst. Prof. Dr. Mohammed Al-Yadoumi.				
.10	Location of Teaching the Course:	Labor Market (Industrial Firms).				
11.	Prepared by:	Associate Prof. Dr. Abdul-Malik Momin.				
12.	Date of Approval:					

II.Course/ Field Training Description:

Industrial Training refers to the work experience that is relevant to professional development in which students will relate knowledge and skills learned at the university with practical skills and the applications in the industry. This course describes how the students can perform their industrial training at the labor market. Each organization or factory requires different knowledge regarding the courses which have been taken in the previous years. During the industrial training, the students can build a platform and compare the theoretical aspects with the practical one which exists in the prescribed industry. The course is divided into 14 weeks and the students will spend number of weeks in the industries which are related to the applications of Mechatronics Engineering. Industrial training could be arranged through correspondence between the Faculty of Engineering and Industrial Plants.

Head of the Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Assoc. Prof. Dr. Abdul-Malik Momin	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas

III.Course Intended learning outcomes (CILOs) of the course		Referenced PILOs
a1.	Characterize the basic principles of design regarding the Mechatronics systems.	A2
a2.	Identify different methodologies used for solving real problems.	A3
a3.	Describe professional ethics in actual practice.	A6
b1.	Explore suitable methods for solving mechatronics problems.	B1
b2.	Contrast the problems related to the real applications.	B2
c1.	Implement experiments in the specialized areas.	C1
c2.	Conduct main experiments using automatic systems.	C3
c3.	Apply feasibility studies for special projects.	C4
c4.	Perform with standard specifications during the design.	C5
d1.	Evaluate effectively the progress work with the support of the audiences.	D2
d2.	Rate an awareness of ethical principles during the work in the firm.	D4
d3.	Assess technical reports through different forms.	D6
d4.	Review a literature from different sources.	D7

(A) Alignment Course Intended Learning Outcomes of Knowledge and Understanding to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
a1. Characterize the basic principles of design regarding the Mechatronics systems.	• Active Lectures. • Orientation and Organization. • Field Visit.	• Follow up Scheme. • Seminar. • Oral Discussion. • Field Supervision Report.
a2. Identify different methodologies used for solving real problems.	• Active Lectures.	• Presentation. • Written Assessment.
a3. Describe professional ethics in actual practice.	• Active Lectures.	• Written Assessment.

(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies

Explore suitable methods for solving mechatronics problems. **b1.**	• Active Lectures. • Orientation and Organization.	• Written Reports. • Seminar. • Field Supervision Report.
Contrast the problems related to the real applications. **b2.**	• Active Lectures.	• Written Reports. • Seminar.

© **Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies:**		
Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
Implement experiments in the specialized areas. **c1.**	• Active Lectures. • Lab. Specifications.	• Seminar. • Field Supervision Report. • Lab. Report.
Conduct main experiments using automatic systems. **c2.**	• Active Lectures. • Lab. Specifications.	• Seminar. • Lab. Report.
Apply feasibility studies for special projects. **c3.**	• Active Lectures.	• Written Reports.
Perform with standard specifications during the design. **c4.**	• Active Lectures.	• Written Reports.

(D) **Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:**		
Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
Evaluate effectively the work with the progress audiences. support of the **d1.**	• Orientation and Organization.	• Seminar. • Field Supervision Report. • Academic Supervision Report.
Rate an awareness of ethical principles during the work in the firm. **d2.**	• Orientation and Organization. • Field Supervisor.	• Seminar. • Field Supervision Report. • Academic Supervision Report.
Assess technical reports different forms. through **d3.**	• Active Lectures.	• Field Supervision Report. • Academic Supervision Report.

Head of the Department Assoc. Prof. Dr. Abdul-Malik Momin	Quality Assurance Unit Assoc. Prof. Dr. Mohammad Algorafi	Dean of the Faculty Prof. Dr. Mohammed AL-Bukhaiti	Academic Development Center & Quality Assurance Assoc. Prof. Dr. Huda Al-Emad	Rector of Sana'a University Prof. Dr. Al-Qassim Mohammed Abbas

Review a literature from different sources. **d4.**	• Active Lectures.	• Written Reports.

IV.Field Training Aims:

1.Brief Description of the Main Learning Outcomes for Students Participating in the Field of Training Tasks:

The Aims of the Course are:

- To relate the concept learned at the Faculty level to industrial application in the field of Mechatronics Engineering.
- To develop work attitudes like curiousness, self-confidence, maturity and self-reliance.
- To acquire additional knowledge, upgrade their skills and modify their studies.
- To obtain knowledge of potential careers and develop new areas of interest.
- To develop practical and communication skills / competencies of future engineers.
- To strengthen industrial/Faculty partnership.
- To develop the student's personality and understanding of individuals and groups in work situations.
- To understand the constraints of working life and functional relationships within and between organizations.
- To analyze and interpret a complete system available in the industry.

2. Briefly Describe any Plans for Developing and Improving the Field of Training Tasks which are being Implemented:

1. Proper orientation and supervision between the Faculty of Engineering and industrial firm.
2. Correspondence with the firms to ensure the vacancies regarding the training.
3. Justification that the students have obtained their training in a proper way through field visits.
4. Proper selection of the firms related to the applications of Mechatronics Engineering.
5. Feedback received from the industrial firms.

V.Description of Field Training Tasks:

1. At What Stage or Stages during the Program does the Field Training Occur?

The field training will occur in the fifth year second semester of the program.

2. Procedures of Training:

1. Registration of the qualified students for the training.
2. Orientation of the students regarding the importance of the training.
3. Organization for the training.
4. Assigned academic supervision.

Head of the Department Assoc. Prof. Dr. Abdul-Malik Momin	Quality Assurance Unit Assoc. Prof. Dr. Mohammad Algorafi	Dean of the Faculty Prof. Dr. Mohammed AL-Bukhaiti	Academic Development Center & Quality Assurance Assoc. Prof. Dr. Huda Al-Emad	Rector of Sana'a University Prof. Dr. Al-Qassim Mohammed Abbas

5. Academic supervisors have to conduct several field visits.
6. Correspondence between the Faculty of Engineering and the industrial firms.
7. Training will be conducted for the duration of 9 weeks in different industrial firms.
8. Student training report should be completed under the supervision of the field supervisor and the academic supervisor from the Faculty.
9. Industrial feedback report regarding the performance and attendance of the students.
10. Seminar and presentation after completion of the training.
11. General evaluation from the Mechatronics Staff.

3. Students Tasks:

1. Students should complete a minimum of 150 credit hours before the commencement of the training.
2. The students are encouraged to apply for the industrial training (either a state institution or a private company).
3. The place chosen for the training should give some exposure in the field of Mechatronics.
4. Students should follow the rules and regulations of the required firm during the training course.
5. Completion of the training should be implemented in the scheduled duration.
6. The students should participate in an academic way to reach to the target of the training.
7. The students are required to apply their knowledge earned during their study in a more systematic way during the training.
8. The students should submit detailed report regarding their training.
9. The students should give presentation of their work after completion of the training.

4. Students Assignments or Reports:

1.	Introduction	The introduction should contain the detailed technical description of the plant and the brief history of the industrial firm.
2.	Aim of the training	The aim of the training should be explained in details regarding the applications of Mechatronics in the selected firm.
3.	Activities implemented during the training	The field supervisor should make a plan of different activities for the students during the field training.
4.	Analysis of the results	The students should analyze their technical results after completion of the training.
5.	Feedback and recommendations	The students have to submit their feedback from the training and make their recommendations for future students training.
6.	Submission of the final report	The students should submit detailed report to Faculty of Engineering-Mechatronics Engineering Department for the preparation of presentation.

5. Students Follow-up:

The Mechatronics Engineering Department will arrange academic supervisors to follow- up the students in the industrial firms to make sure that all the students are implementing their training according to the scheduled planning between Faculty of Engineering-Mechatronics Engineering Departments and the industrial firms.

6. Responsibilities of Academic Supervision in the Field Training:

a. To orient the students in a systematic way.
b. To make the correspondence with the industrial firms under the supervision of Dean of Faculty of Engineering.
c. To divide students into groups according to the needs of the firm.
d. To meet the supervisory staff from the industrial firm to explain the necessity of the training.
e. To visit the students during the duration of the training.
f. To follow-up the training activities.
g. To supervise the students for preparation of the technical reports.
h. To examine the students during presentation and evaluation.

7. Responsibilities of Supervisory from the Field:

1. Dividing the students into groups.
2. Explaining the structure of the firm.
3. Supervision during the training period.
4. Correspondence with Faculty of Engineering-Mechatronics Engineering Department if the students are not attending the training.
5. Submitting the feedback related to the students training activities to the Faculty of Engineering-Mechatronics Engineering Department.

8. Description of the Procedures to be used for Students' Guidance and Support:

1. Proper orientation and guidance to the students.
2. Motivating the students during the period of training.
3. Supporting the students to implement their training and how to relate the theoretical results with the practical one.

9. What are the Facilities and Support given from the Institution in the Field of Training for Students?

1.	Accommodation	Faculty Auditorium and Industrial Firms.
2.	Computer Resources	Computer lab. which is already available for allowing the students for the completion of the technical report after the training.

3.	Learning Support and Materials	a. Text books which are available in the Faculty library according to each specialization. b. Different industrial manuals and manufacturer documents. c. Safety regulation manuals of the different firms.
4.	Others	a. Rules and regulations of the training institution. b. Field visits. c. Arrangement of transportation for the academic staff.

VI.Preparation and Co-ordination:

1. **Identification of Field Placements:** According to the application of Mechatronics.
2. **Preparation of Field Supervisors:** According to the required aim of the training.
3. **Preparation of Students:** The students should be divided into groups according to the necessity of the training.
4. **Safety and Risk Management:** Each firm is kindly required to orient the students according to rules and regulations of the firm and orienting the students towards the safety and risk to be taken into account during the implementation of the training or working in critical places.

VII.Student Assessment:

1. Bases of Assessment:

Order	Description	Mark
1.	Attendance, discipline and industrial supervision report.	25
2.	Single group monthly report.	30
3.	Training report.	50
4.	Participation of team work.	10
5.	Oral tests discussion.	15
6.	Final exam technical report and oral presentation.	20
Total		**150**

2. Field Supervisors Responsibility for Assessment:

Follow- up of the students during the training (ethics, discipline, rules and regulations of the firm).

3. Supervision of Faculty Responsibility for Assessment:

Head of the Department Assoc. Prof. Dr. Abdul-Malik Momin	Quality Assurance Unit Assoc. Prof. Dr. Mohammad Algorafi	Dean of the Faculty Prof. Dr. Mohammed AL-Bukhaiti	Academic Development Center & Quality Assurance Assoc. Prof. Dr. Huda Al-Emad	Rector of Sana'a University Prof. Dr. Al-Qassim Mohammed Abbas

a. Orientation and organization for the training. b. Follow-up of the students. c. Follow-up of the obstacles faced during the training. d. Follow-up of the technical report. e. Follow-up the students and supporting them during preparation of the reports. f. Supervision for the final report and conducting presentation.

VIII.Learning Resources:	
• Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher).	
1- Required Textbook(s) (maximum two).	
	1. All the required text books from the library. 2. Catalogues from the firms.
2- Essential References.	
	-
3- Electronic Materials and Web Sites etc.	
	-

IX.Course Policies:	
.1	**Class Attendance:** The students should have more than 75 % of attendance according to rules and regulations of the Faculty.
.2	**Tardy:** The students should respect the timing of attending the lectures. They should attend within 10 minutes from starting of the lecture.
.3	**Exam Attendance/Punctuality:** The student should attend the exam on time. The punctuality should be implemented according to rules and regulations of the faculty for mid-term exam and final exam.
.4	**Assignments & Projects:** The assignment is given to the students after each chapter, the student has to submit all the assignments for checking on time.
.5	**Cheating**: If any cheating occurred during the examination, the student is not allowed to continue and he has to face the examination committee for enquiries .
6.	**Plagiarism**: The student will be terminated from the Faculty, if one student attend the exam on another university. behalf according to the policy, rules and regulations of the
7.	**Other policies:**

Head of the Department Assoc. Prof. Dr. Abdul-Malik Momin	Quality Assurance Unit Assoc. Prof. Dr. Mohammad Algorafi	Dean of the Faculty Prof. Dr. Mohammed AL-Bukhaiti	Academic Development Center & Quality Assurance Assoc. Prof. Dr. Huda Al-Emad	Rector of Sana'a University Prof. Dr. Al-Qassim Mohammed Abbas

	• All the teaching materials should be kept out the examination hall. • The mobile phone is not allowed. • There should be a respect between the student and his teacher.

Reviewed By	Vice Dean for Academic Affairs and Post Graduate Studies: Asst. Prof. Dr. Tarek A. Barakat. President of Quality Assurance Unit: Assoc. Prof. Dr. Mohammed Algorafi. Asst. Prof. Dr. Hatem Al-Dois.
	Deputy Rector for Academic Affairs Assoc. Prof. Dr. Ibrahim AlMutaa. Assoc. Prof. Dr. Ahmed Mujahed. Asst. Prof. Dr. Munaser Alsubari.

56.Elective Course (1)
Course Specification of Manufacturing Systems Engineering

I. Course Identification and General Information:

1.	Course Title:	Manufacturing Systems Engineering.				
2.	Course Code & Number:	MT310.				
3.	Credit hours:	C.H				TOTAL CR. HRS.
		Th.	Seminar	Pr.	Tu.	
		2	-	-	2	3
4.	Study level/ semester at which this course is offered:	Fourth Year-Second Semester.				
5.	Pre –requisite (if any):	Manufacturing Process.				
6.	Co –requisite (if any):	None.				
7.	Program (s) in which the course is offered:	Mechatronics Engineering Program.				
8.	Language of teaching the course:	English Language.				
9.	Location of teaching the course:	Mechatronics Engineering Department.				
10.	Prepared By:	Assoc. Prof. Dr. Amin Al-Khulaidi.				
11.	Date of Approval:					

II. Course Description:

This course surveys the design and management of manufacturing systems, and also offers the opportunity to understand the relationship between materials flow and information flow. It includes topics such as plant layout, planning, scheduling and control of manufacturing systems with emphasis on information flow and decision-making. Contemporary manufacturing topics are emphasized.

III. Course Intended learning outcomes (CILOs) of the course		Referenced PILOs
a1.	Recognize the fundamentals of manufacturing systems concept.	A2
a2.	Identify the different modes of production.	
b1.	Analyze manufacturing systems through the application of mathematical models.	B1
b2.	Investigate the suitable product, process planning and design for given products.	
c1.	Implement manufacturing systems components.	C2
c2.	Demonstrate methods and tools used in manufacturing systems	
d1.	Cooperate as a part of a team in discussion group for a real case study.	D1
d2.	Evaluate manufacturing systems case study and required reporting.	D6

(A) Alignment Course Intended Learning Outcomes of Knowledge and Understanding to Teaching Strategies and Assessment Strategies:

Course Intended Learning Outcomes		Teaching Strategies	Assessment Strategies
Recognize the fundamentals of manufacturing systems concept.	**a1.**	• Lectures. • Tutorials.	• Homework. • Quizzes. • Written Exams.
Identify the different modes of production.	**a2.**		

(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies:

Course Intended Learning Outcomes		Teaching Strategies	Assessment Strategies
Analyze manufacturing systems through the application of mathematical models.	**b1.**	• Lectures. • Tutorials,	• Homework. • Quizzes, • Written Exams.
Investigate the suitable product, process planning and design for given products.	**b2.**		

Head of the Department	Quality Assurance Unit	Dean of the Faculty	Academic Development Center & Quality Assurance	Rector of Sana'a University
Assoc. Prof. Dr. Abdul-Malik Momin	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad	Prof. Dr. Al-Qassim Mohammed Abbas

© Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
Implement manufacturing systems components. **c1.**	• Lectures. • Tutorials.	• Homework. • Quizzes. • Written Exams.
Demonstrate methods and tools used in manufacturing systems **c2.**		

(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
Cooperate as a part of a team in discussion group for a real case study. **d1.**	• Lectures.	• Quizzes. • Written Exams.
Evaluate manufacturing systems case study and required reporting. **d2.**		

IV.Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	Contact Hours
1.	Fundamentals of Manufacturing Systems.	a1,b1,c1	- Fundamentals of Manufacturing. - Fundamentals of Manufacturing Systems Modes. - Productivity Measurement.	1	2
2.	Modes of Production.	a1,a2,b2, c1,d1	- Classification of Industry and Different Between Service and Manufacturing Industry. - Types of Production and their Features. - Multi-Product, Small-Batch Production.	1	2
3.	Plant Layout Planning and Design.	a1,a2,b1, b2,c1,c2, d1,d2	- Scope and Problems of Layout Planning for Different Production Modes. - Systematic Layout Planning (Assembly Line Design, Job Shop Layout Design, Cellular Design). - Mathematical Layout Design.	3	6

Head of the Department
Assoc. Prof. Dr. Abdul-Malik Momin

Quality Assurance Unit
Assoc. Prof. Dr. Mohammad Algorafi

Dean of the Faculty
Prof. Dr. Mohammed AL-Bukhaiti

Academic Development Center & Quality Assurance
Assoc. Prof. Dr. Huda Al-Emad

Rector of Sana'a University
Prof. Dr. Al-Qassim Mohammed Abbas

			- Production Flow Analysis. - Materials Handling System Design and Analysis.		
4.	Process Planning and Design.	A1,a2,b2 ,c1,c2,d2	- The Required Machines/ Equipment for New Product. - Scope and Problems of Process Planning. - Process Design for a Real Case. - Optimum Routing Analysis. - Assembly Line Balancing Process Design.	2	4
5.	Mid- Term Exam.	a1, a2, b1, b2, c1, c2	- The First 4 Chapters.	1	2
6.	Production Planning and Control.	a1,a2,,b2 ,c1,c2,d2	- Product Planning, the Steps/Sequence required for New Products. - Product Design and its Manufacturing Sequence. - Scope and Problems of Production Control. - Process Control. - Inventory Control.	2	4
7.	Production Scheduling.	a1,a2,b1, c1,c2,d1, d2	- Scope of Production Scheduling. - Process Scheduling Sequencing and Dispatching. - EBQ.	2	4
8.	Logistics Planning.	a1,a2 b1, c1,c2,d1	- Introduction to Supply Chain Management. - Transportation Problems. - Distribution Problems.	1	2
9.	Engineering Cost Analysis.	a1, b1, c2,d1	- Types of Production Cost. - Break-Even Point Analysis. - Wages and Incentives. - Deprecation.	1	2
10.	Review.	a1,a2,b1, b2,c1,c2, d1,d2	- All the Chapters.	1	2
11.	Final Exam.	a1, a2, b1, b2, c1, c2	- All the Chapters.	1	2

Number of Weeks /and Units Per Semester	16	32

B – Tutorial Aspect:

Order	Tasks/ Experiments	Number of Weeks	Contact hours	Learning Outcomes
1.	Fundamentals of Manufacturing Systems.	1	2	a1,b1,c1
2.	Modes of Production.	1	2	a1,a2,b2,c1,d1
3.	Plant Layout Planning and Design.	3	6	a1,a2,b1,b2,c1,c2,d1,d2
4.	Process Planning and Design.	2	4	a1,a2,b2,c1,c2,d2
5.	Production Planning and Control.	2	4	a1,a2,,b2,c1,c2,d2
6.	Production Scheduling.	2	4	a1,a2,b1, c1,c2,d1,d2
7.	Logistics Planning.	1	2	a1,a2 b1, c1,c2,d1
8.	Engineering Cost Analysis.	1	2	a1, b1, c2,d1
9.	Review.	1	2	a1,a2,b1,b2,c1,c2,d1,d2
Number of Weeks /and Units Per Semester		**14**	**28**	

V.Teaching strategies of the course:

- Lectures.
- Group Discussion.
- Tutorials.

VI.Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1.	- Problems of Suitable Plant Layout Design. - Plant Layout Flow Analysis. - Assignment Modeling for Selective Cases in Plant Layout.	a1,a2,b1,b2,c1,c2,d1,d2	3	2.5
2.	- Assembly Line Balancing Design.	a1,a2,b2,c1,c2,d2	6	2.5
3.	- Process scheduling Sequencing and Dispatching. - EBQ. - Inventory Control	a1,a2,b1, c1,c2,d1,d2	8	2.5
4.	- Transportation Problems - Break-Even Point Analysis. - Wages and Incentives. - Deprecation.	a1,a2 b1, c1,c2,d1	10	2.5

Total	10

VII.Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1.	Assignment.	1-14	15	10%	a1,a2,b1,b2,c1,c2,d1,d2
2.	Mid-Term Exam.	8	30	20%	a1,a2,b1,b2,c1,c2,d1,d2
3.	Final Exam (theoretical).	16	105	70%	a1,a2,b1,b2,c1,c2,d1,d2
Total			**150**	**100%**	

VIII.Learning Resources:

- Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher).

1- Required Textbook(s) (maximum two).

1. R. Shanker (2004), Industrial Engineering and Management,1st Edition, Galgotia Publications pvt. Ltd., New Delhi, India.
2. KatsundoHitomi: (1996) "Manufacturing Systems Engineering, 2nd Edition, Taylor&Fra ISBN978-0-7484-0324-0.

2- Essential References.

1. George Chryssolouris (2006) "Manufacturing Systems Theory and Practice (2nd Ed.)" Springer ISBN978-0-387-25683-2.
2. Katsundo Hitomi: (2008)"Introduction to Manufacturing Systems Engineering (5th Ed.)" (Kyoritsu Publishing, ISBN978-4-320-08172-7, in Japanese.

3- Electronic Materials and Web Sites *etc*.

1- Arena Simulation Software (assembly line balancing, flow analysis,…).
2- CRAFT Plant-Layout Software.
3- Production Planning and Control Software.

IX.Course Policies:

1.	**Class Attendance:** - A student should attend not less than 75 % of total hours of the subject; otherwise he will not be able to take the exam and will be considered as exam failure. If the student is absent due to illness, he/she should bring a approved statement from university Clinic.
2.	**Tardy:** - For late in attending the class, the student will be initially notified. If he repeated lateness in attending class he will be considered as absent.

3.	**Exam Attendance/Punctuality:** - A student should attend the exam on time. He is Permitted to attend an exam half one hour from exam beginning, after that he/she will not be permitted to take the exam and he/she will be considered as absent in exam.
4.	**Assignments & Projects:** - The assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time.
5.	**Cheating**: - For cheating in exam, a student will be considered as fail. In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty.
6.	**Plagiarism**: Plagiarism is the attending of a student the exam of a course instead of another student. If the examination committee proved a plagiarism of a student, he will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Council Affair of the university
7.	**Other Policies:** - Mobile phones are not allowed to use during a class lecture. It must be closed, otherwise the student will be asked to leave the lecture room - Mobile phones are not allowed in class during the examination. Lecture notes and assignments my given directly to students using soft or hard copy

Reviewed By	Vice Dean for Academic Affairs and Post Graduate Studies: Asst. Prof. Dr. Tarek A. Barakat. President of Quality Assurance Unit: Assoc. Prof. Dr. Mohammed Algorafi. Head of Mechatronics Engineering Department: Assoc. Prof. Dr. Abdul-Malik Momin.
	Deputy Rector for Academic Affairs Assoc. Prof. Dr. Ibrahim AlMutaa. Assoc. Prof. Dr. Ahmed Mujahed. Asst. Prof. Dr. Munaser Alsubari.

Elective Course (1)

Template for Course Plan of Manufacturing Systems Engineering

I. Information about Faculty Member Responsible for the Course:		
Name of Faculty Member	Assoc. Prof. Dr. Amin Al-Khulaidi.	**Office Hours**

Head of the Department Assoc. Prof. Dr. Abdul-Malik Momin	Quality Assurance Unit Assoc. Prof. Dr. Mohammad Algorafi	Dean of the Faculty Prof. Dr. Mohammed AL-Bukhaiti	Academic Development Center & Quality Assurance Assoc. Prof. Dr. Huda Al-Emad	Rector of Sana'a University Prof. Dr. Al-Qassim Mohammed Abbas

Location& Telephone No.	-	SAT	SUN	MON	TUE	WED	THU
E-mail	-	8-10					

II. Course Identification and General Information:

1.	Course Title:	Manufacturing Systems Engineering.				
2.	Course Code & Number:	MT310.				
3.	Credit hours:	C.H				TOTAL Cr. Hrs.
		Th.	Seminar	Pr.	Tu.	
		2	-	-	2	3
4.	Study level/ semester at which this course is offered:	Fourth Year-Second Semester.				
5.	Pre –requisite (if any):	Manufacturing Process.				
6.	Co –requisite (if any):	None.				
7.	Program (s) in which the course is offered:	Mechatronics Engineering Program.				
8.	Language of teaching the course:	English Language.				
9.	System of Study:	Semesters.				
10.	Mode of delivery:	Lectures and Tutorials.				
11.	Location of teaching the course:	Mechatronics Engineering Department.				

III. Course Description:

This course surveys the design and management of manufacturing systems, and also offers the opportunity to understand the relationship between materials flow and information flow. It includes topics such as plant layout, planning, scheduling and control of manufacturing systems with emphasis on information flow and decision-making. Contemporary manufacturing topics are emphasized.

IV. Course Intended learning outcomes (CILOs) of the course		Referenced PILOs
a1.	Recognize the fundamentals of manufacturing systems concept.	A2
a2.	Identify the different modes of production.	
b1.	Analyze manufacturing systems through the application of mathematical models.	B1

b2.	Investigate the suitable product, process planning and design for given products.	
c1.	Implement manufacturing systems components.	C2
c2.	Demonstrate methods and tools used in manufacturing systems	
d1.	Cooperate as a part of a team in discussion group for a real case study.	D1
d2.	Evaluate manufacturing systems case study and required reporting.	D6

V.Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
1.	Fundamentals of Manufacturing Systems.	- Fundamentals of Manufacturing. - Fundamentals of Manufacturing Systems Modes. - Productivity Measurement.	1	2
2.	Modes of Production.	- Classification of Industry and Different Between Service and Manufacturing Industry. - Types of Production and their Features. - Multi-Product, Small-Batch Production.	1	2
3.	Plant Layout Planning and Design.	- Scope and Problems of Layout Planning for Different Production Modes. - Systematic Layout Planning (Assembly Line Design, Job Shop Layout Design, Cellular Design). - Mathematical Layout Design. - Production Flow Analysis. - Materials Handling System Design and Analysis.	3	6
4.	Process Planning and Design.	- The Required Machines/ Equipment for New Product. - Scope and Problems of Process Planning. - Process Design for a Real Case. - Optimum Routing Analysis. - Assembly Line Balancing Process Design.	2	4
5.	Mid- Term Exam.	- The First 4 Chapters.	1	2
6.	Production Planning and Control.	- Product Planning, the Steps/Sequence required for New Products. - Product Design and its Manufacturing Sequence. - Scope and Problems of Production Control. - Process Control.	2	4

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		- Inventory Control.		
7.	Production Scheduling.	- Scope of Production Scheduling. - Process Scheduling Sequencing and Dispatching. - EBQ.	2	4
8.	Logistics Planning.	- Introduction to Supply Chain Management. - Transportation Problems. - Distribution Problems.	1	2
9.	Engineering Cost Analysis.	- Types of Production Cost. - Break-Even Point Analysis. - Wages and Incentives. - Deprecation.	1	2
10.	Review.	- All the Chapters.	1	2
11.	Final Exam.	- All the Chapters.	1	2
Number of Weeks /and Units Per Semester			**16**	**32**

B – Tutorial Aspect:

Order	Tasks/ Experiments	Number of Weeks	Contact hours	Learning Outcomes
1.	Fundamentals of Manufacturing Systems.	1	2	a1,b1,c1
2.	Modes of Production.	2	2	a1,a2,b2,c1,d1
3.	Plant Layout Planning and Design.	3,4,5	6	a1,a2,b1,b2,c1,c2,d1,d2
4.	Process Planning and Design.	6,7	4	A1,a2,b2,c1,c2,d2
5.	Production Planning and Control.	8,9	4	a1,a2,,b2,c1,c2,d2
6.	Production Scheduling.	10,11	4	a1,a2,b1, c1,c2,d1,d2
7.	Logistics Planning.	12	2	a1,a2 b1, c1,c2,d1
8.	Engineering Cost Analysis.	13	2	a1, b1, c2,d1
9.	Review.	14	2	a1,a2,b1,b2,c1,c2,d1,d2
Number of Weeks /and Units Per Semester		**14**	**28**	

VI.Teaching strategies of the course:

- Lectures.
- Group Discussion.
- Tutorials.

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VII.Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1.	- Problems of Suitable Plant Layout Design. - Plant Layout Flow Analysis. - Assignment Modeling for Selective Cases in Plant Layout.	a1,a2,b1,b2,c1,c2,d1 ,d2	3	2.5
2.	- Assembly Line Balancing Design.	a1,a2,b2,c1,c2,d2	6	2.5
3.	- Process Scheduling Sequencing and Dispatching. - EBQ. - Inventory Control.	a1,a2,b1, c1,c2,d1,d2	8	2.5
4.	- Transportation Problems. - Break-Even Point Analysis. - Wages and Incentives. - Deprecation.	a1,a2 b1, c1,c2,d1	10	2.5
Total				**10**

VIII.Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1.	Assignment.	1-14	15	10%	a1,a2,b1,b2,c1,c2,d1,d2
2.	Mid-Term Exam.	8	30	20%	a1,a2,b1,b2,c1,c2,d1,d2
3.	Final Exam (theoretical).	16	105	70%	a1,a2,b1,b2,c1,c2,d1,d2
Total			**150**	**100%**	

IX.Learning Resources:

- Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher).

1- Required Textbook(s) (maximum two).

1. R. Shanker (2004), Industrial Engineering and Management,1st Edition, Galgotia Publications pvt. Ltd., New Delhi, India.
2. KatsundoHitomi: (1996) "Manufacturing Systems Engineering, 2nd Edition, Taylor&Fra ISBN978-0-7484-0324-0.

2- Essential References.

1. George Chryssolouris (2006) "Manufacturing Systems Theory and Practice (2nd Ed.)" Springer ISBN978-0-387-25683-2.

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	2. Katsundo Hitomi: (2008)"Introduction to Manufacturing Systems Engineering (5th Ed.)" (Kyoritsu Publishing, ISBN978-4-320-08172-7, in Japanese.
	3- Electronic Materials and Web Sites *etc*.
	1. Arena Simulation Software (assembly line balancing, flow analysis,…). 2. CRAFT Plant-Layout Software. 3. Production Planning and Control Software.

X.Course Policies:

1.	**Class Attendance:** The student should be attending not less than 75% of total contact hours of the subject, otherwise he will not able to take exam and considered as an exam failure. If the student is absent due to illness, he/she should bring the approved statement from university Clinic.
2.	**Tardy:** For late in attending the class, the student will be initially notified. If he comes late in attending class again, he will consider as absent.
3.	**Exam Attendance/Punctuality:** The student should attend the exam on time. He is Permitted to attend the exam half one hour from exam beginning, after that he/she will not be permitted to take exam and he/she is considered absent in exam.
4.	**Assignments & Projects:** In general, one assignment is given after each chapter of a course. The student should submit the assignment on time, mostly one week after giving the assignment.
5.	**Cheating**: For cheating in exam, the student considered as failure. Case the cheating repeated three times during study the student will disengage from the Faculty
6.	**Plagiarism**: Plagiarism is the attending of the student the exam of a course instead of other student. If the examination committee proved a plagiarism of a student, he will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Affair Council of the university.
7.	**Other Policies:** - The mobile phone is not allowed to be used during class lecture. It must be closed, otherwise the student will ask to leave the lecture room - The mobile phone is not allowed to be taken with in class during the examination. - Lecture notes and assignments may be given directly to students using soft or hard copy.

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