33.Course Specification of Electrical Machines (1)

I.Course Identification and General Information:						
1.	Course Title:	Electrical Machines (1).				
.2	Course Code & Number:	MT206.				
.3	Credit hours:	C.H				TOTAL CR. HRS.
		Th.	Seminar	Pr.	Tu.	
		2		2	2	4
.4	Study level/ semester at which this course is offered:	Third Year-First Semester.				
.5	Pre –requisite (if any):	Electrical Circuits (2).				
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. Radwan Mohammed AL Bouthigy.				
11.	Date of Approval:					

II.Course Description:

This course is designed to provide principal concepts of electrical machines as a major Mechatronics system component. The course includes: Electromechanical energy conversion (EMEC) principles, the construction, classification, performance characteristics, analysis, parallel operation, testing and applications of: Single and three-phase transformers. DC generators machines, and DC motors machines as well as, starting and speed control of the different types of motors.

III.Course Intended learning outcomes (CILOs) of the course		Referenced PILOs
a1.	Characterize the components of DC machines and transformers.	A1, A3
a2.	Depict the equivalent circuit, the mathematical model, and the operation conditions, starting methods and speed control of DC machines and transformers.	A6, A8

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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

b1.	Explore the methods of controlling the generated voltage and speed of DC machines.	B1,B2,B3
b2.	Analyze the operation conditions, modeling and design principles of DC machines and transformer using mathematical models and computer simulation.	B1,B2,B3
c1.	Demonstrate the effect of unbalanced loading on DC machine and transformer with different connections, and the effects and limitations of each connection, and measure the efficiency and the short circuit impedance of a single/ three-phase transformers from no-load test, winding resistance, short circuit test, and load test.	C1,C2
c2.	Implement the load characteristics of various DC motors and generators under different loading conditions.	C1,C2
d1.	Co-operate in teams to conduct experiments, analyze results, and develop technically sound reports of outcomes.	D1,D3,D6
d2.	Review transferable skills of problem solving and design.	D1,D3,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
a1. Characterize the components of DC machines and transformers.	• Lectures, • Tutorial, • Interactive Class Discussions, • Laboratory Experiments, • Self-Study, • Homework.	• Assignments, • Written Exams, • Quizzes.
a2. Depict the equivalent circuit, the mathematical model, and the operation conditions, starting methods and speed control of DC machines and transformers.	• Lectures, • Tutorial, • Interactive Class Discussions, • Laboratory Experiments, • Self-Study, • Homework.	• Assignments, • Written Exams, • Quizzes.

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

Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
b1. Explore the methods of controlling the generated voltage and speed of DC machines.	• Lectures, • Interactive Class Discussions, • Homework, • Laboratory Experiments, • Self and • Cooperative Learning.	• Assignments, • Quizzes, • Written Exams, • Homework. • Lab. Reports.
b2. Analyze the operation conditions, modeling and design principles of DC machines and transformer using mathematical models and computer simulation.	• Lectures, • Interactive Class Discussions, • Homework, • Laboratory Experiments, • Self and • Cooperative Learning.	• Assignments, • Quizzes, • Written Exams, • Homework. • Lab. Reports.

© **Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies:**		
Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
c1. Demonstrate the effect of unbalanced loading on DC machine and transformer with different connections, and the effects and limitations of each connection, and measure the efficiency and the short circuit impedance of a single/ three-phase transformers from no-load test, winding resistance, short circuit test, and load test.	• Lectures, • Interactive Class Discussion, • Exercises, • Series of Laboratory experiment, • Self-Study Assignments and Homework.	• Quizzes, • Laboratory Assignments and Reports, • Homework, • Mid-Term and Final Exams.

c2. Implement the load characteristics of various DC motors and generators under different loading conditions.	• Lectures, • Interactive Class Discussion, • Exercises, • Series of Laboratory experiment, • Self-Study Assignments and Homework.	• Quizzes, • Laboratory Assignments and Reports, • Homework, • Mid-Term and Final Exams.

(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
d1. Co-operate in teams to conduct experiments, analyze results, and develop technically sound reports of outcomes.	• Lectures, • Interactive Class Discussion, • Self-Study Assignments and Homework.	• Laboratory Reports, Assignments, • Quizzes, • Written Exams, • Lab. Exams, • Homework.
d2. Review transferable skills of problem solving and design.	• Lectures, • Interactive Class Discussion, • Self-Study Assignments and Homework.	• Laboratory Reports, Assignments, • Quizzes, • Written Exams, • Lab. Exams, • Homework.

IV.Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	Contact Hours
1.	Introduction to Electrical Machines.	a1,a2,b 1,b2.	• Magnetic circuits • Definition of motor and generator.	2	4

			• Torque development due to alignment of two fields and the concept of torque angle. • Electro-magnetically induced emf. • Elementary concept of an electrical machine.		
2.	DC Generators.	a1, a2, b1, b2, c1, c2, d1, d2.	• Types, Construction, Operation principles and application areas. • The performance characteristics and the equivalent circuit of DC generators. • Modelica and/or MATLAB modeling of DC generator (self-study).	4	8
3.	Mid-Term Exam.	a1, a2, b1, b2.	• The First 2 Chapters.	1	2
4.	DC Motors.	a1, a2, b1, b2, c1, c2, d1, d2.	• Main distinction between DC generators and motors. • Types, Construction, Operation principles and application areas of DC motors. • Performance characteristics and the equivalent circuit of DC motors. • Speed control of DC motors. • The mathematical and MATLAB model of DC motor.	4	8
5.	Single Phase Transformers.	a1, a2, b1, b2, c1, c2, d1, d2.	• Ideal transformer • Real transformer - Construction - Operation - Equivalent circuit	2	4

			- Modeling, Power and efficiency. - Transformers Modelica and/or Simulink-MATLAB modeling-self-study assignment and resources.		
6.	Three Phase Transformers.	a1, a2, b1, b2, c1, c2, d1, d2.	• Types of transformers. • three-phase transformers: - Construction - Equivalent circuit - Major parameters - Modeling and Power and efficiency. - Winding group - Parallel operations and grouping numbers. - Transformers Modelica and/or Simulink-MATLAB modeling- self-study assignment and resources.	2	4
7.	Final Exam.	a1, a2, b1, b2,	All Chapters.	1	2
Number of Weeks /and Units Per Semester				**16**	**32**

B- Tutorials Aspect:

Order	Tutorial Skills List	Number of Weeks	Contact Hours	CILOs
1.	• Calculation of magnetic circuits, magnetic flux, flux density, magnetic field intensity, and permeability. • Force and torque calculations.	2	4	a1,a2,b1,b2, c1,c2,d1,d2.

2.	• Equivalent circuit of types DC generator. • The performance characteristics. • Graphical analysis. • Modelica and/or MATLAB simulation of DC generator.	4	8	a1,a2,b1,b2,c1,c2,d1,d2.
3.	• Equivalent circuit of types DC motor. • The performance characteristics. • Graphical analysis • Speed regulation • The mathematical and Modelica and/or MATLAB model of DC motors. • Speed – torque control of DC motors.	4	8	a1,a2,b1,b2,c1,c2,d1,d2.
4.	• Determination of a single phase Transformers' Parameters. • Performance characteristics. • Phasor diagram • Voltage regulation • Equivalent circuit • Modelica and/or MATLB Transformer modeling.	2	4	a1,a2,b1,b2,,c1,c2,d1,d2.
5.	• Calculation of a three phase Transformers' Parameters. • Performance characteristics. • Phasor diagram • Voltage regulation • Modelica and/or MATLB Transformer modeling.	2	4	a1,a2,b1,b2,c1,c2,d1,d2.
Number of Weeks /and Units Per Semester		**14**	**28**	

C - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	Contact Hours	Learning Outcomes
1.	• Safety regulations and requirements in electrical laboratories. • Introduction to main laboratory devices and instrumentations.	1	2	a1,a2,b1,b2,c1,c2,d1, d2.

	• Introduction to main measurement devices. • Reporting format.			
2.	• Open circuit characteristics of a separately excited D.C generator • Terminal characteristics of a separately excited D.C generator	2	4	a1,a2,.b1,b2,c1,c2,d1, d2.
3.	• Terminal characteristics of a shunt, series and compound generators	2	4	a1,a2,b1,b2,c1,c2,d1, d2.
4.	• Terminal characteristics of a separately, shunt, series and compound motors. • Starting control of D.C motors	4	8	a1,a2,b1,b2,c1,c2,d1, d2.
5.	• Open-circuit, Short-circuit and load test of single phase transformer. • Parameters of single phase transformer.	2	4	a1,a2,b1,b2,c1,c2,d1, d2.
6.	• Open-circuit, Short-circuit and load test of three phase transformer. • Parameters of three phase transformer.	2	4	a1,a2,b1,b2,c1,c2,d1, d2.
7.	• Laboratory exam.	1	2	a1,a2,b1,b2.
Number of Weeks /and Units Per Semester		**14**	**28**	

V.Teaching strategies of the course:

- Lectures.
- Interactive Class Discussion.
- Tutorial Classes and Exercises.
- Series of Laboratory Experiment.
- Self-Study of Computer Aided Design Software like Modelica and/MATLAB.

VI.Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1.	Comparison between types of DC generator.	a1,a2,b1,b2,d2.	3th	2
2.	Design and implementation of DC generator circuits using MATLAB tools.	a1,a2,b1,b2,c1.	4th	2

3.	Design and implementation of DC motor circuits using MATLAB tools.	a1,a2,b1,b2,c1.	6th	2
4.	Design and implementation of transformer circuits using MATLAB tools.	a1,a2,b1,b2,c1.	8th	2
5.	Lab-reports.	a1,a2,b1,b2.	Weekly	2
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.	Quizzes.	4th,7th,10th, and 13th	20	10%	a1,a2,b1,b2.
2.	Assignments & Homework, Tasks & Presentation.	Weekly	20	10%	a1,a2,b1,b2,d2.
3.	Mid-Term Exam.	7th	20	10%	a1,a2,b1,b2.
4.	Final Exam Practical.	15th	20	10%	a1,a2,b1,b2,c1,c2,d2.
5.	Final Exam Theory.	16th	120	60%	a1,a2,b1,b2.
Total			**200**	**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- Chapman S. J. (2005), Electric Machinery Fundamentals,4 th Edition, McGraw-Hill.
2- Fitzgerald A. E. (2003), Electric Machinery, 6th Edition, McGraw-Hill.

2- Essential References.

1. D.F. Warne (2000), Newnes Electrical Engineer's Handbook, 1 st Edition, Biddles Ltd- wwv. biddlesxo. Uk.
2. Nasar S. A. (1998), Electric Machines and Electromechanics, 2 nd Edition, Schaum's Outlines Series- McGraw-Hill.
3. Bandyopadhyay M.N, (2009), ELECTRICAL MACHINES: THEORY AND PRACTICE, 1st Edition, Prentice-hall of India Pvt Ltd.
4. Bimbhra P.S.,(1995), Electric Machinery , 7 th Edition Khanna Publishers.

3- Electronic Materials and Web Sites *etc*.

1. Modelica Association (2000). ModelicaTM - A Unified Object-Oriented Language for Physical Systems Modeling. Tutorial Version 1.4 (ModelicaTutorial14.pdf). Available from: https://modelica.org/documents/
2. MapleSim Video Tutorial: Modelica Video lectures available form: http://www.youtube.com/watch?v=reehU1dzeDc.
3. Simulink-Matlab tutorial for beginners Video lectures available form:
4. http://www.youtube.com/results?search_query=simulink+tutorial+for+beginners&oq=simulink&gs_l=youtube.1.9.0l10.337429.342148.0.351270.8.8.0.0.0.0.738.2481.3j3-2j2j0j1.8.0...0.0...1ac.1.11.youtube.iIK7kMX6hfo

IX.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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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 and Asst. Prof. Dr. Munaser Alsubari.

Template for Course Plan of Electrical Machines (1)

I.Information about Faculty Member Responsible for the Course:							
Name of Faculty Member	Assoc. Prof. Dr. Radwan AL-Bouthigy	Office Hours					
Location& Telephone No.	775284933	SAT	SUN	MON	TUE	WED	THU
E-mail	Radwan006@yahoo.com						

II.Course Identification and General Information:						
1.	Course Title:	Electrical Machines (1).				
2.	Course Code & Number:	MT206.				
3.	Credit hours:	C.H				Total Cr.Hrs.
		Th.	Tr.	Pr.	Tu.	
		2	2	2	-	4
4.	Study level/ semester at which this course is offered:	Third Year-First Semester.				
5.	Pre –requisite (if any):	Electrical Circuits (2).				
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.				

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9.	Location of teaching the course:	Mechatronics Engineering Department.
10.	Prepared By:	Assoc. Prof. Dr. Radwan Mohammed AL Bouthigy.
11.	Date of Approval:	

III.Course Description:

This course is designed to provide principal concepts of electrical machines as a major Mechatronics system component. The course includes: Electromechanical energy conversion (EMEC) principles, the construction, classification, performance characteristics, analysis, parallel operation, testing and applications of: Single and three-phase transformers. DC generators machines, and DC motors machines as well as, starting and speed control of the different types of motors.

IV.Course Intended learning outcomes (CILOs) of the course		Referenced PILOs
a1.	Characterize the components of DC machines and transformers.	A1, A3
a2.	Depict the equivalent circuit, the mathematical model, and the operation conditions, starting methods and speed control of DC machines and transformers.	A6, A8
b1.	Explore the methods of controlling the generated voltage and speed of DC machines.	B1,B2,B3
b2.	Analyze the operation conditions, modeling and design principles of DC machines and transformer using mathematical models and computer simulation.	B1,B2,B3
c1.	Demonstrate the effect of unbalanced loading on DC machine and transformer with different connections, and the effects and limitations of each connection, and measure the efficiency and the short circuit impedance of a single/ three-phase transformers from no-load test, winding resistance, short circuit test, and load test.	C1,C2
c2.	Implement the load characteristics of various DC motors and generators under different loading conditions.	C1,C2
d1.	Co-operate in teams to conduct experiments, analyze results, and develop technically sound reports of outcomes.	D1,D3,D6
d2.	Review transferable skills of problem solving and design.	D1,D3,D6

V.Course Content:

- Distribution of Semester Weekly Plan of Course Topics/Items and Activities.

A – Theoretical Aspect:				
Order	**Units/Topics List**	**Sub Topics List**	**Number of Weeks**	**Contact Hours**
1.	Introduction to Electrical Machines.	• Magnetic circuits • Definition of motor and generator. • Torque development due to alignment of two fields and the concept of torque angle. • Electro-magnetically induced emf. • Elementary concept of an electrical machine.	1,2	4
2.	DC Generators.	• Types, Construction, Operation principles and application areas. • The performance characteristics and the equivalent circuit of DC generators. • Modelica and/or MATLAB modeling of DC generator (self-study).	3,4,5,6	8
3.	Mid-Term Exam.	• The First 2 Chapters.	7	2
4.	DC Motors.	• Main distinction between DC generators and motors. • Types, Construction, Operation principles and application areas of DC motors. • Performance characteristics and the equivalent circuit of DC motors. • Speed control of DC motors. • The mathematical and MATLAB model of DC motor.	8,9,10,11	8
5.	Single Phase Transformers.	- Ideal transformer - Real transformer • Construction • Operation • Equivalent circuit • Modeling , Power and efficiency.	12,13	4

		• Transformers Modelica and/or Simulink-MATLAB modeling- self-study assignment and resources.		
6.	Three Phase Transformers.	- Types of transformers. - three-phase transformers: • Construction • Equivalent circuit • Major parameters • Modeling and Power and efficiency. • Winding group • Parallel operations and grouping numbers. • Transformers Modelica and/or Simulink-MATLAB modeling- self-study assignment and resources.	14,15	4
7.	Final Exam.	All Chapters.	16	2
Number of Weeks /and Units Per Semester			**16**	**32**

B. Tutorials Aspect:

Order	Tutorial Skills List	Number of Weeks	Contact Hours	Learning Outcomes
1.	• Calculation of magnetic circuits, magnetic flux, flux density, magnetic field intensity, and permeability. • Force and torque calculations.	1,2	4	a1,a2,b1,b2, c1,c2,d1,d2.
2.	• Equivalent circuit of types DC generator. • The performance characteristics. • Graphical analysis. • Modelica and/or MATLAB simulation of DC generator.	3,4,5,6	8	a1,a2,b1,b2,c1,c2,d 1,d2.
3.	• Equivalent circuit of types DC motor. • The performance characteristics. • Graphical analysis • Speed regulation • The mathematical and Modelica and/or MATLAB model of DC motors. • Speed – torque control of DC motors.	7,8,9,10	8	a1,a2,b1,b2,c1,c2,d 1,d2.

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4.	• Determination of a single phase Transformers' Parameters. • Performance characteristics. • Phasor diagram • Voltage regulation • Equivalent circuit • Modelica and/or MATLB Transformer modeling.	11,12	4	a1,a2,b1,b2,,c1,c2,d1,d2.
5.	• Calculation of a three phase Transformers' Parameters. • Performance characteristics. • Phasor diagram • Voltage regulation • Modelica and/or MATLB Transformer modeling.	13,14	4	a1,a2,b1,b2,c1,c2,d1,d2.
Number of Weeks /and Units Per Semester		**14**	**28**	

C - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	Contact Hours	Learning Outcomes
1.	• Safety regulations and requirements in electrical laboratories. • Introduction to main laboratory devices and instrumentations. • Introduction to main measurement devices. • Reporting format.	1	2	a1,a2,b1,b2,c1,c2, d1,d2.
2.	• Open circuit characteristics of a separately excited D.C generator • Terminal characteristics of a separately excited D.C generator	2,3	4	a1,a2,.b1,b2,c1,c2, d1,d2.
3.	• Terminal characteristics of a shunt, series and compound generators	4,5	4	a1,a2,b1,b2,c1,c2, d1,d2.
4.	• Terminal characteristics of a separately, shunt, series and compound motors. • Starting control of D.C motors	6,7,8,9	8	a1,a2,b1,b2,c1,c2, d1,d2.
5.	• Open-circuit, Short-circuit and load test of single phase transformer.	10,11	4	a1,a2,b1,b2,c1,c2, d1,d2.

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	• Parameters of single phase transformer.			
6.	• Open-circuit, Short-circuit and load test of three phase transformer. • Parameters of three phase transformer.	12,13	4	a1,a2,b1,b2,c1,c2, d1,d2.
7.	• Laboratory exam.	14	2	a1,a2,b1,b2.
Number of Weeks /and Units Per Semester		**14**	**28**	

VI.Teaching strategies of the course:

- Lectures.
- Interactive Class Discussion.
- Tutorial Classes and Exercises.
- Series of Laboratory Experiment.
- Self-study of Computer Aided Design Software Like Modelica and/MATLAB.

VII.Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1.	Comparison between types of DC generator	a1,a2,b1,b2,d2.	3th	2
2.	Design and implementation of DC generator circuits using MATLAB tools	a1,a2,b1,b2,c1.	4th	2
3.	Design and implementation of DC motor circuits using MATLAB tools	a1,a2,b1,b2,c1.	6th	2
4.	Design and implementation of transformer circuits using MATLAB tools	a1,a2,b1,b2,c1.	8th	2
5.	Lab-reports	a1,a2,b1,b2.	Weekly	2
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.	Quizzes.	4th,7th,10th, and 13th	20	10%	a1,a2,b1,b2.

2.	Assignments & Homework, Tasks & Presentation.	Weekly	20	10%	a1,a2,b1,b2,d2.
3.	Mid-Term Exam.	7th	20	10%	a1,a2,b1,b2.
4.	Final Exam Practical.	15th	20	10%	a1,a2,b1,b2,c1,c2,d2.
5.	Final Exam Theory.	16th	120	60%	a1,a2,b1,b2.
Total			**200**	**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. Chapman S. J. (2005), Electric Machinery Fundamentals,4 th Edition, McGraw-Hill.
2. Fitzgerald A. E. (2003), Electric Machinery, 6 th Edition, McGraw-Hill.

2- Essential References.

1. D.F. Warne (2000), Newnes Electrical Engineer's Handbook, 1 st Edition, Biddles Ltd- wwv. biddlesxo. Uk.
2. Nasar S. A. (1998), Electric Machines and Electromechanics, 2 nd Edition, Schaum's Outlines Series- McGraw-Hill.
3. Bandyopadhyay M.N, (2009), ELECTRICAL MACHINES: THEORY AND PRACTICE, 1st Edition, Prentice-Hall of India Pvt Ltd.
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1. Modelica Association (2000). ModelicaTM - A Unified Object-Oriented Language for Physical Systems Modeling. Tutorial Version 1.4 (ModelicaTutorial14.pdf). Available from: https://modelica.org/documents/
2. MapleSim Video Tutorial: Modelica Video lectures available form: http://www.youtube.com/watch?v=reehU1dzeDc.
3. Simulink-Matlab tutorial for beginners Video lectures available form:
4. http://www.youtube.com/results?search_query=simulink+tutorial+for+beginners&oq=simulink&gs_l=youtube.1.9.0l10.337429.342148.0.351270.8.8.0.0.0.0.738.2481.3j3-2j2j0j1.8.0...0.0...1ac.1.11.youtube.iIK7kMX6hfo

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.

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