Program Specifications
University: Ain Shams   Faculty: Engineering

A- Basic Information

1. Programme title: **B. SC. in Mechanical Power Engineering**

2. Programme type: Single ■   Double ☐   Multiple ☐
3. Faculty: Faculty of Engineering – Ain Shams University
4. Department(s) offering the Program: **Mechanical Power Engineering**
5. Coordinator: **Dr. Walid Aboelsoud**
6. External evaluator(s):   **Prof. Hany Moneeb**
7. Internal Evaluator: **Prof. Nabil Abdelaziz**
8. Date of program bylaw approval: **2003**
9. Date of program specifications approval: **September 2018**

B- Professional Information

1. Program Mission:

The mission of the Mechanical Power Engineering program is to provide quality education that is professional and technology-based. The department is very keen to provide society with future generations of mechanical power engineers who are technically skilled and ethically professional. The program mission is therefore based on the following intentions:

PM 1. To induce innovation and critical thinking.

PM 2. To contribute into the development of the society by providing alumni who can use scientific thinking and new technology to achieve development while maintaining sustainability.

PM 3. To teach students the skills and ethics required for long-term learning and challenging professional practice.

PM 4. To provide students with the required basic knowledge of engineering sciences and interpersonal skills to understand and coordinate with other specialists in a successful teamwork.

2. Program Aims

The main aims of the " Mechanical Power Engineering " program at the "Faculty of Engineering" in "Ain Shams University" are to equip the student with the proper scientific knowledge and develop his/her skills to:

1. Apply knowledge of mathematics, science and engineering concepts to the solution of engineering problems.

2. Design a system; component and process to meet the required needs within realistic constraints.

3. Design and conduct experiments as well as analyse and interpret data.

4. Identify, formulate and solve fundamental engineering problems.

5. Use the techniques, skills, and appropriate engineering tools, necessary for engineering practice and project management.

6. Work effectively within multi-disciplinary teams.

7. Communicate effectively.

8. Consider the impacts of engineering solutions on society & environment.

9. Demonstrate knowledge of contemporary engineering issues.

10. Display professional and ethical responsibilities; and contextual understanding

11. Engage in self- and life- long learning.

12. Evaluate the sustainability and environmental issues related to mechanical power systems.

13. Use energy efficiently.

14. Apply industrial safety.

15. Apply and integrate knowledge, understanding and skills of different subjects and available computer software to solve real problems in industries and power stations.

16. Lead or supervise a group of engineers, technicians and work force.

17. Carry out preliminary designs of fluid transmission and power systems, investigate their performance and solve their essential operational problems.

18. Design, operate and maintain internal combustion and steam engines.

3. Intended learning outcomes (ILOs)

a- Knowledge and understanding:

The graduates of the program should be able to demonstrate the knowledge and understanding of:

A1- Concepts & theories of mathematics and sciences, appropriate to the discipline.

A2- Basics of information and communication technology (ICT)

A3- Characteristics of engineering materials related to the discipline.

A4- Principles of design including elements design, process and/or a system related to specific disciplines.

A5- Methodologies of solving engineering problems, data collection and interpretation

A6- Quality assurance systems, codes of practice and standards, health and safety requirements and environmental issues.

A7- Business and management principles relevant to engineering.

A8- Current engineering technologies as related to disciplines.

A9- Topics related to humanitarian interests and moral issues.

A10- Technical language and report writing.

A11- Professional ethics and impacts of engineering solutions on society and environment.

A12- Contemporary engineering topics.

A13- Fundamentals of thermal and fluid processes.

A14- Internal combustion, pumps, turbines and compressors, classification, construction design concepts, operation and characteristics.

A15- Fluid power systems.

A16- The constraints which mechanical power and energy engineers have to judge to reach at an optimum solution.

A17- Business and management techniques and practices appropriate to mechanical power and energy engineering applications.

A18- Mechanical power and energy engineering contemporary issues.

A19- Basic theories and principles of some other engineering and mechanical engineering disciplines providing support to mechanical power and energy disciplines.

b- Intellectual skills:

The graduates of the program should be able to

B1- Select appropriate mathematical and computer-based methods for modelling and analysing problems.

B2- Select appropriate solutions for engineering problems based on analytical thinking.

B3- Think in a creative and innovative way in problem solving and design.

B4- Combine, exchange, and assess different ideas, views, and knowledge from a range of sources.

B5- Assess and evaluate the characteristics and performance of components, systems and processes.

B6- Investigate the failure of components, systems, and processes.

B7- Solve engineering problems, often on the basis of limited and possibly contradicting information.

B8- Select and appraise appropriate ICT tools to a variety of engineering problems.

B9- Judge engineering decisions considering balanced costs, benefits, safety, quality, reliability, and environmental impact.

B10- Incorporate economic, societal, environmental dimensions and risk management in design.

B11- Analyse results of numerical models and assess their limitations.

B12- Create systematic and methodical approaches when dealing with new and advancing technology.

B13- Evaluate mechanical power and energy engineering designs, processes and performances and propose improvements.

B14- Analyze and interpret data, and design experiments to obtain new data.

B15- Evaluate the power losses in the fluid transmission lines and networks.

B16- Analyze the performance of the basic types of internal combustion engines and hydraulic machines.

B17- Analyze fluid power systems, subsystems and various control valves and actuators.

c- Professional and practical skills:

The graduates of the program should be able to:

C1- Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to solve engineering problems.

C2- Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services.

C3- Create and/or re-design a process, component or system, and carry out specialized engineering designs.

C4- Practice the neatness and aesthetics in design and approach.

C5- Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design experiments, collect, analyse and interpret results.

C6- Use a wide range of analytical tools, techniques, equipment, and software packages pertaining to the discipline and develop required computer programs.

C7- Apply numerical modelling methods to engineering problems.

C8- Apply safe systems at work and observe the appropriate steps to manage risks.

C9- Demonstrate basic organizational and project management skills.

C10- Apply quality assurance procedures and follow codes and standards.

C11- Exchange knowledge and skills with engineering community and industry.

C12- Prepare and present technical reports.

C13- Use basic workshop equipment safely and appropriately.

C14- Prepare engineering drawings, computer graphics and specialized technical reports.

C15- Write computer programs pertaining to mechanical power and energy engineering.

C16- Describe the basic Thermal and fluid processes mathematically and use the computer software for their simulation and analysis.

C17- Design, operate, repair and maintain fluid hydraulic power systems for diverse applications.

C18- Carry out preliminary designs of fluid transmission networks, internal combustion and steam engines and solve their operational problems.

C19- Work in mechanical power and energy operations, maintenance and overhaul.

d- General and transferable skills:

The graduates of the program should be able to:

D1- Collaborate effectively within multidisciplinary team.

D2- Work in stressful environment and within constraints.

D3- Communicate effectively.

D4- Demonstrate efficient IT capabilities.

D5- Lead and motivate individuals.

D6- Effectively manage tasks, time, and resources.

D7- Search for information and engage in life-long self-learning discipline.

D8- Acquire entrepreneurial skills.

D9- Refer to relevant literatures.

4. Academic standards

The "Mechanical Power Engineering" program ADOPTS the **N**ational **A**cademic **R**eference **S**tandards (**NARS**) for "Mechanical Power Engineering" prepared by the National Authority for Quality Assurance and Accreditation of Education-Egypt., 2nd Ed., August 2009. And this adoption has been approved by the Academic Department Council at June 2010.

- See Table [1] for a relationship matrix of **"Program ILOs Vs the NARS**'s **ILOs"**.
- See Table [2] for a relationship matrix of **"Program Aims Vs NARS's Graduate's Attributes"**.
- See Table [3] for a relationship matrix of **"Institute's Mission Vs Program's Mission**".
- See Table [4] for a relationship matrix of **" Program's Mission Vs Program's Aims**".
- See Table [5] for a relationship matrix of **" Program's Aims Vs Program's ILOs**".
- See Table [6] for a relationship matrix of "**Program's ILOs Vs Program's Courses"**.

5. Curriculum structure and contents

a- Programme duration:
   Five Years, - 300 contact hours

b- Programme structure

Lectures	168h	Practical	132h	Total	300h
Compulsory	288h	Elective	12h	Optional/Selective	0h

	Subject Area	NARS%	Program%
A	Humanities and Social Sciences (Univ. Req.)	11 (9-12 %)	**11**
B	Mathematics and Basic Sciences	21 (20-26 %)	**20**
C	Basic Engineering Sciences (Faculty/Spec. Req.)	21 (20-23 %)	**20**
D	Applied Engineering and Design	21 (20-22 %)	**25**
E	Computer Applications and ICT*	10 (9-11 %)	**9**
F	Projects* and Practice	9 (8-10 %)	**9**
G	Discretionary (Institution character-identifying) subjects	7 (6-8 %)	**6**
	Total	84	100

See appendix - Table [7] for courses classification according to subject area.

c- Programme courses

<table>
<tr><th colspan="8">LEVEL 1</th></tr>
<tr><th colspan="2" rowspan="2">Code No.</th><th rowspan="2">Course Title</th><th rowspan="2">No. of units</th><th colspan="3">No. of hours / week</th><th rowspan="2">Compulsory</th><th rowspan="2">Semester</th></tr>
<tr><th>Lect.</th><th>Tut./ Lab.</th><th>Exer.</th></tr>
<tr><td>PHM</td><td>011</td><td>Mathematics (1)</td><td>NA</td><td>4</td><td>0</td><td>2</td><td rowspan="5">Compulsory</td><td rowspan="5">1st</td></tr>
<tr><td>PHM</td><td>021</td><td>Physics (1)</td><td>NA</td><td>4</td><td>1</td><td>1</td></tr>
<tr><td>PHM</td><td>031</td><td>Mechanics (1)</td><td>NA</td><td>2</td><td>1</td><td>1</td></tr>
<tr><td>MDP</td><td>021</td><td>Engineering Drawing & Projection</td><td>NA</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>PHM</td><td>041</td><td>Chemistry</td><td>NA</td><td>2</td><td>0</td><td>1</td></tr>
</table>

Code No.		Course Title	No. of units	Lect.	Tut./Lab.	Exer.	Compulsory	Semester
CSE	011	Computer Technology	NA	4	1	1		
PHM	011	Mathematics (1)	NA	4	0	2	Compulsory	2nd
PHM	021	Physics (1)	NA	4	1	1		
PHM	031	Mechanics (1)	NA	2	1	1		
MDP	021	Engineering Drawing & Projection	NA	1	0	4		
MDP	022	Production Technology & Engineering History	NA	2	0	0		
HUM	x11	Technical English Language	NA	4	2	1		
Total				34	7	19		
				60				

LEVEL 2

Code No.		Course Title	No. of units	No. of hours / week			Compulsory	Semester
				Lect.	Tut./Lab.	Exer.		
PHM	112	Mathematics (2)	NA	4	0	2	Compulsory	1st
MDP	161	Machine Drawing	NA	0	0	4		
PHM	122	Physics (2)	NA	2	1	1		
PHM	132	Mechanics (2)	NA	2	0	2		
CES	112	Theory of Structure	NA	2	0	2		
MDP	131	Materials Engineering & Testing	NA	4	2	2		
PHM	112	Mathematics (2)	NA	4	0	2	Compulsory	2nd
MDP	161	Machine Drawing	NA	0	0	4		
EPM	112	Electrical & Electronic Engineering	NA	4	0	2		
MDP	111	Manufacturing Technology (1)	NA	4	1	2		
MEP	111	Thermodynamics (1)	NA	2	0	2		
HUM	X12	Technical Report Writing	NA	2	0	1		
Total				30	4	26		
				60				

LEVEL 3

Code No.		Course Title	No. of units	No. of hours / week			Compulsory	Semester
				Lect.	Tut./Lab.	Exer.		
MDP	251	Mechanics of Machines (1)	NA	2	0	2	Compulsory	1st
MDP	252	Machine Construction	NA	2	0	2		
EPM	212	Electrical Engineering	NA	2	0	2		
MDP	221	Stress Analysis	NA	2	0	2		
MEP	212	Thermodynamics (2)	NA	4	0	4		
MEP	231	Fluid Dynamics	NA	4	1	1		
MDP	251	Mechanics of Machines (1)	NA	2	0	2	Compulsory	2nd
MDP	252	Machine Construction	NA	2	0	2		
MDP	211	Manufacturing Technology (2)	NA	4	2	1		
MEP	221	Heat & Mass Transfer	NA	4	1	2		
MEP	281	Measurements	NA	3	2	0		
HUM	X31	Engineering Economy	NA	2	0	1		
Total				33	6	21		
				60				

LEVEL 4

Code No.		Course Title	No. of units	No. of hours / week			Compulsory	Semester
				Lect.	Tut./ Lab.	Exer.		
MDP	362	Machine Construction & Design of Mechanical Equipment	NA	3	1	3	Compulsory	1st.
MEP	331	Turbomachinery (1)	NA	4	1	1		
MEP	351	Power Stations	NA	3	0	1		
MEP	361	Combustion	NA	4	0	2		
MEP	391	Elective Course (1)	NA	2	0	1		
HUM	X32	Project Management	NA	2	0	2		
EPM	334	Electrical Power Engineering	NA	4	0	2	Compulsory	2nd
MDP	354	Mechanics of Machines (2)	NA	4	0	2		
MEP	362	Internal Combustion Engines (1)	NA	4	1	1		
MEP	381	Automatic Control (1)	NA	4	0	2		
MEP	392	Elective Course (2)	NA	2	0	1		
HUM	X21	Management & Marketing	NA	2	0	1		
Total				38	3	19		
				60				

		Elective Course (1)					Elective	1st.
MDP	331	Engineering Materials (Advanced)	NA	2	0	1		
MDP	355	Introduction to Mechatronics	NA	2	0	1		
		Elective Course (2)					Elective	2nd
MDP	363	Introduction to Computer-Aided Design & Manufacturing	NA	2	0	1		
MEP	352	Renewable Energy	NA	2	0	1		

LEVEL 5

Code No.		Course Title	No. of units	No. of hours / week			Compulsory	Semester
				Lect.	Tut./ Lab.	Exer.		
MEP	431	Turbomachinery (2)	NA	3	1	1	Compulsory	1st.
MEP	451	Power Stations	NA	3	1	1		
MEP	471	Refrigeration & Air conditioning	NA	3	1	1		
MEP	499	Project	NA	0	4	0		
MEP	481	Automatic Control	NA	3	1	1		
MEP	492	Elective Course (3)	NA	2	0	1		
HUM	X41	Legislations & Contracts	NA	2	0	1		
MEP	431	Turbomachinery (2)	NA	3	1	1	Compulsory	2nd
MEP	451	Power Stations	NA	3	1	1		
MEP	471	Refrigeration & Air conditioning	NA	3	1	1		
MEP	499	Project	NA	0	4	0		
MEP	461	Internal Combustion Engines (2)	NA	4	1	0		
MEP	493	Elective Course (4)	NA	2	0	1		
HUM	X42	Environmental Impact of Projects	NA	2	0	1		
Total				33	16	11		
				60				

		Elective Course (3)					Elective	1st.
MDP	425	Introduction to Industrial Organization	NA	2	0	1		
MEP	421	Pipelines Networks	NA	2	0	1		

		Elective Course (4)					Elective	2nd
MDP	426	Introduction in Quality Systems	NA	2	0	1		
MEP	482	Modelling and Simulation of Thermal Power Systems	NA	2	0	1		

6. Program admission requirements

Having Egyptian Secondary education or equivalent certificate with major in Mathematics.

7. Regulations for progression and program completion

a- The student is considered successful if he passes the examinations in all courses of his class.

b- The student is promoted to the next higher level if he fails in not more than two subjects of his class or from lower classes,

c- In addition to the two subjects mentioned in the previous item, the student who fails in two subjects in humanities and social sciences, whether from his class or from lower classes, is admitted to the transfer to the consecutive higher level. Passing successfully in all courses before obtaining the B.Sc. degree is a prerequisite.

d- The referred student has to sit the examination in the courses in which he has failed together with the students studying the same courses. The student gets a pass grade when he passes the examination successfully. In case the student was considered absent with acceptable excuse in a course, he gets the actual grade,

e- The grades of the successful student in a course and in the general grade are evaluated as follows
  a. Distinction: from 85% of the total mark and upwards.
  b. Very good: from 75% to less than 85% of the total mark.
  c. Good from: 65% to less than 75% of the total mark
  d. Pass: from: 50% to less than 65% of the total mark

f- The grades of a failing student in a course is estimated in one of' the following grades:
  a. Weak: from 30% to less than 50% of the total mark
  b. Very Weak: less than 30% of the total mark.

g- The B.Sc. general grade for students is based on the cumulative marks obtained during all the years of study. The students are then arranged serially according their cumulative sum.

h- The student is awarded an honour degree if his cumulative sum is distinction or very good provided that he gets a grade not less than very good in any class of study other than the preparatory year. Moreover, he should have not failed in any examination he has sat in any class other than the preparatory year.

8. Program ILOs Assessment Methods

The following table illustrates the assessment methods and what they assess in most cases. For further details refer to the courses' specifications.

	Program ILOs			
	K&U	Intellectual	Professional	General
Written Exams	■	■	■	
Practical Exams	■		■	■
Oral Exams	■	■		■
Projects	■	■	■	■
Researches	■		■	■

9. Evaluation of program intended learning outcomes

Evaluator	Tool	Sample
1-Senior students	Evaluation sheet	50%
2-Alumni	Evaluation sheet & interview	10%
3-Stakeholders (Employers)	Evaluation sheet & interview	25%
4-External and internal Evaluators	Evaluation report	1 for each
5- Other: Faculty Members	Evaluation sheet	50%

Appendix

| NARS ILOs | a- Knowledge and understanding | | | | | | | | | | | | | | | | | | | b- Intellectual skills | | | | | | | | | | | | | | | | | | |
| | Engineer Generally should know | | | | | | | | | | | | In addition, Mechanical Power engineer should know | | | | | | | Engineer generally should be able to | | | | | | | | | | | | In addition, Mechanical Power engineer should be able to | | | | | | |
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14	B15	B16	B17	B18	B19
A1	■																																					
A2		■																																				
A3			■																																			
A4				■																																		
A5					■																																	
A6						■																																
A7							■																															
A8								■																														
A9									■																													
A10										■																												
A11											■																											
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A13													■																									
A14														■																								
A15															■																							
A16																■																						
A17																	■																					

| NARS ILOs | a- Knowledge and understanding | | | | | | | | | | | | | | | | | | | b- Intellectual skills | | | | | | | | | | | | | | | | | | |
| | Engineer Generally should know | | | | | | | | | | | | In addition, Mechanical Power engineer should know | | | | | | | Engineer generally should be able to | | | | | | | | | | | | In addition, Mechanical Power engineer should be able to | | | | | | |
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14	B15	B16	B17	B18	B19
A18																		■																				
A19																			■																			
B1																				■																		
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B14																																	■					
B15																																		■				
B16																																			■			

NARS ILOs	a- Knowledge and understanding																			b- Intellectual skills																		
	Engineer Generally should know												In addition, Mechanical Power engineer should know							Engineer generally should be able to												In addition, Mechanical Power engineer should be able to					
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14	B15	B16	B17	B18	B19
B17																																					▓		
B18																																						▓	
B19																																							▓

| NARS ILOs | c- Professional and practical skills | | | | | | | | | | | | | | | | | | | d- General and Transferable | | | | | | | | |
| | Engineer generally should be able to | | | | | | | | | | | In addition, Mechanical Engineer should be able to | | | | | | | Mechanical Engineer should be able to | | | | | | | | | |
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	D1	D2	D3	D4	D5	D6	D7	D8	D9
C1	■																											
C2		■																										
C3			■																									
C4				■																								
C5					■																							
C6						■																						
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D4																							■					
D5																								■				
D6																									■			
D7																										■		
D8																											■	
D9																												■

Table [2] The relationship matrix of **"Program Aims Vs NARS's Graduate's Attributes"**.																			
		NARS's Graduate's Attributes (GA)																		
		Engineer General Attributes											Specialized Engineer Specialized Attributes							
		A	B	C	D	E	F	G	H	I	J	K	a	b	c	d	e	f	g
Program Aims (PA)	PA 1	▓																	
	PA 2		▓																
	PA 3			▓															
	PA 4				▓														
	PA 5					▓													
	PA 6						▓												
	PA 7							▓											
	PA 8								▓										
	PA 9									▓									
	PA 10										▓								
	PA 11											▓							
	PA 12												▓						
	PA 13													▓					
	PA 14														▓				
	PA 15															▓			
	PA 16																▓		
	PA 17																	▓	
	PA 18																		▓

Table [3] The relationship matrix of **"Institute's Mission Vs Program's Mission"**.				
Program's Mission (PM)				
Institute's Mission (IM)		PM 1	PM 2	PM 3	PM 4

Institute's Mission (IM)	PM 1	PM 2	PM 3	PM 4
IM 1		■		■
IM 2	■		■	
IM 3	■	■	■	■
IM 4			■	■
IM 5		■		
IM 6		■		

Table [4] The relationship matrix of **"Program's Mission Vs Program's Aims"**.				

Program Aims (PA)	PM 1	PM 2	PM 3	PM 4
PA 1			■	■
PA 2	■	■		■
PA 3	■	■		■
PA 4	■			■
PA 5		■		■
PA 6				
PA 7			■	■
PA 8		■		■
PA 9			■	
PA 10			■	■
PA 11			■	
PA 12		■		
PA 13	■	■		
PA 14		■		
PA 15	■			■
PA 16				■
PA 17		■		■
PA 18				■

Table [5] The relationship matrix of **" Program's Aims Vs Program's ILOs "**.

		Program Aims (PA)																	
		PA 1	PA 2	PA 3	PA 4	PA 5	PA 6	PA 7	PA 8	PA 9	PA 10	PA 11	PA 12	PA 13	PA 14	PA 15	PA 16	PA 17	PA 18
Program ILOs	A1	x																x	
	A2						x		x			x							
	A3					x									x				
	A4		x	x		x													
	A5											x	x	x					
	A6				x					x							x		
	A7											x					x		
	A8																	x	x
	A9						x				x	x							
	A10							x						x					
	A11					x							x						
	A12													x				x	
	A13	x				x								x					
	A14																	x	x
	A15													x		x		x	
	A16				x											x			
	A17		x											x					
	A18									x									
	A19			x					x										
	B1												x			x			
	B2					x										x			
	B3				x						x								
	B4			x													x		
	B5		x								x								
	B6				x							x							
	B7			x		x													
	B8								x							x			
	B9		x												x				
	B10											x	x	x					
	B11				x	x				x									
	B12			x		x			x										
	B13												x	x					x
	B14		x	x															
	B15			x														x	
	B16																x		x
	B17											x							x
	C1	x	x																
	C2				x				x		x								
	C3		x	x															x
	C4								x							x			
	C5							x			x					x			
	C6			x												x			

Table [5] The relationship matrix of **" Program's Aims Vs Program's ILOs "**.

	PA 1	PA 2	PA 3	PA 4	PA 5	PA 6	PA 7	PA 8	PA 9	PA 10	PA 11	PA 12	PA 13	PA 14	PA 15	PA 16	PA 17	PA 18
C7		x								x								
C8											x	x				x		
C9						x				x								
C10								x							x			
C11						x					x							
C12				x			x											
C13														x				x
C14					x												x	
C15			x													x		
C16	x	x													x			
C17	x																x	
C18						x												x
C19												x					x	
D1						x									x			
D2					x		x											
D3							x					x						
D4										x					x			
D5				x												x		
D6				x									x					
D7					x	x					x							
D8				x					x	x								
D9			x								x							

Code	Course Name	a- Knowledge and understanding																		
	ILOs	Engineer Generally should know												In addition, Mechanical Engineer should know						
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19
PHM011	Mathematics (1)	X																		
PHM021	Physics (1)	X		X																
PHM031	Mechanics (1)				X															
MDP021	Engineering Drawing & Projection					X														
PHM041	Chemistry			X																
CSE011	Computer Technology					X														
MDP022	Production Technology & Engineering History			X					X											
HUMX11	Technical English Language											X								
PHM112	Mathematics (2)	X			X															
MDP161	Machine Drawing				X				X											
PHM122	Physics (2)	X				X														
PHM132	Mechanics (2)		X										X							
CES112	Theory of Structure					X			X	X										
MDP131	Materials Engineering & Testing			X								X								
EPM112	Electrical & Electronic Engineering																			X

Code	Course Name	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19
	ILOs			Engineer Generally should know										In addition, Mechanical Engineer should know						
MDP111	Manufacturing Technology (1)																X			
MEP111	Thermodynamics (1)													X	X					
HUMX12	Technical Report Writing						X				X									
MDP251	Mechanics of Machines (1)																		X	
MDP252	Machine Construction																			X
EPM212	Electrical Engineering	X																		
MDP221	Stress Analysis																X		X	
MEP212	Thermodynamics (2)														X					
MEP231	Fluid Dynamics															X				
MDP211	Manufacturing Technology (2)								X											
MEP221	Heat & Mass Transfer													X						
MEP281	Measurements																X		X	
HUMX31	Engineering Economy																	X		
MDP362	Machine Construction & Design of Mechanical Equipment																			X
MEP331	Turbomachinery (1)														X					

		a- Knowledge and understanding																		
ILOs		Engineer Generally should know												In addition, Mechanical Engineer should know						
Code	Course Name	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19
MEP351	Power Stations															X			X	
MEP361	Combustion														X					
MDP331	Engineering Materials (Advanced)			X																
MDP355	Introduction to Mechatronics	X												X						
HUMX32	Project Management							X										X		
EPM334	Electrical Power Engineering	X																		
MDP354	Mechanics of Machines (2)																			X
MEP362	Internal Combustion Engines (1)														X					
MEP381	Automatic Control (1)														X					
MDP363	Introduction to Computer-Aided Design & Manufacturing					X											X			
MEP352	Renewable Energy																		X	
HUMX21	Management & Marketing											X						X		
MEP431	Turbomachinery (2)														X					
MEP451	Power Stations														X				X	
MEP471	Refrigeration & Air conditioning													X					X	

| Code | Course Name | a- Knowledge and understanding | | | | | | | | | | | | | | | | | | |
| | | Engineer Generally should know | | | | | | | | | | | | In addition, Mechanical Engineer should know | | | | | | |
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19
MEP499	Project													X			X			X
MEP481	Automatic Control																X			
MDP425	Introduction to Industrial Organization																	X		
MEP421	Pipelines Networks													X	X					
HUMX41	Legislations & Contracts											X								
MEP461	Internal Combustion Engines (2)														X					
MDP426	Introduction in Quality Systems						X					X								
MEP482	Modelling and Simulation of Thermal Power Systems																			X
HUMX42	Environmental Impact of Projects											X								

Code	Course Name	b- Intellectual skills																
		Engineer Generally should be able to												In addition, Mechanical Engineer should be able to				
		B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14	B15	B16	B17
PHM011	Mathematics (1)	X																
PHM021	Physics (1)		X															
PHM031	Mechanics (1)					X	X											
MDP021	Engineering Drawing & Projection								X									
PHM041	Chemistry		X															
CSE011	Computer Technology								X									
MDP022	Production Technology & Engineering History									X								
HUMX11	Technical English Language											X						
PHM112	Mathematics (2)		X	X														
MDP161	Machine Drawing				X													
PHM122	Physics (2)					X												
PHM132	Mechanics (2)						X											
CES112	Theory of Structure													X				
MDP131	Materials Engineering & Testing											X						

Code	Course Name		B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14	B15	B16	B17
	ILOs		**b- Intellectual skills**																
			Engineer Generally should be able to												In addition, Mechanical Engineer should be able to				
EPM112	Electrical & Electronic Engineering		X																
MDP111	Manufacturing Technology (1)										X	X							
MEP111	Thermodynamics (1)														X	X			
HUMX12	Technical Report Writing										X								
MDP251	Mechanics of Machines (1)				X														
MDP252	Machine Construction													X					
EPM212	Electrical Engineering														X				
MDP221	Stress Analysis							X	X										
MEP212	Thermodynamics (2)															X	X		
MEP231	Fluid Dynamics																X		X
MDP211	Manufacturing Technology (2)											X							
MEP221	Heat & Mass Transfer					X												X	
MEP281	Measurements																		
HUMX31	Engineering Economy											X							
MDP362	Machine Construction & Design of Mechanical Equipment				X														

	ILOs	b- Intellectual skills																
		Engineer Generally should be able to												In addition, Mechanical Engineer should be able to				
Code	Course Name	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14	B15	B16	B17
MEP331	Turbomachinery (1)																X	
MEP351	Power Stations													X		X		
MEP361	Combustion																X	
MDP331	Engineering Materials (Advanced)					X										X		
MDP355	Introduction to Mechatronics						X		X									
HUMX32	Project Management									X	X							
EPM334	Electrical Power Engineering	X													X			
MDP354	Mechanics of Machines (2)					X								X				
MEP362	Internal Combustion Engines (1)														X	X		
MEP381	Automatic Control (1)								X						X			X
MDP363	Introduction to Computer-Aided Design & Manufacturing								X						X			
MEP352	Renewable Energy		X										X			X		
HUMX21	Management & Marketing							X			X							
MEP431	Turbomachinery (2)														X			X
MEP451	Power Stations													X				

Code	Course Name	b- Intellectual skills																
	ILOs (Engineer Generally should be able to / In addition, Mechanical Engineer should be able to)	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14	B15	B16	B17
MEP471	Refrigeration & Air conditioning					X										X		
MEP499	Project													X	X			X
MEP481	Automatic Control																X	X
MDP425	Introduction to Industrial Organization							X			X							
MEP421	Pipelines Networks														X			X
HUMX41	Legislations & Contracts									X								
MEP461	Internal Combustion Engines (2)																X	
MDP426	Introduction in Quality Systems					X								X				
MEP482	Modelling and Simulation of Thermal Power Systems														X			
HUMX42	Environmental Impact of Projects							X					X					

| | ILOs | c- Professional and practical skills | | | | | | | | | | | | | | | | | | |
| | | Engineer Generally should be able to | | | | | | | | | | | | In addition, Mechanical Engineer should be able to | | | | | | |
Code	Course Name	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19
PHM011	Mathematics (1)	X																		
PHM021	Physics (1)		X																	
PHM031	Mechanics (1)				X															
MDP021	Engineering Drawing & Projection			X																
PHM041	Chemistry	X																		
CSE011	Computer Technology					X	X													
MDP022	Production Technology & Engineering History								X											
HUMX11	Technical English Language											X	X							
PHM112	Mathematics (2)	X	X																	
MDP161	Machine Drawing				X		X													
PHM122	Physics (2)		X																	
PHM132	Mechanics (2)							X												
CES112	Theory of Structure			X																
MDP131	Materials Engineering & Testing		X																	

Code	Course Name	c- Professional and practical skills																		
		Engineer Generally should be able to												In addition, Mechanical Engineer should be able to						
		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19
EPM112	Electrical & Electronic Engineering								X					X						
MDP111	Manufacturing Technology (1)				X															
MEP111	Thermodynamics (1)														X					
HUMX12	Technical Report Writing												X			X				
MDP251	Mechanics of Machines (1)																	X		
MDP252	Machine Construction							X		X										
EPM212	Electrical Engineering		X				X													
MDP221	Stress Analysis														X					
MEP212	Thermodynamics (2)																X			
MEP231	Fluid Dynamics																		X	
MDP211	Manufacturing Technology (2)										X									
MEP221	Heat & Mass Transfer																X			
MEP281	Measurements														X			X		
HUMX31	Engineering Economy								X			X								
MDP362	Machine Construction & Design of Mechanical Equipment				X		X													

| Code | Course Name | c- Professional and practical skills | | | | | | | | | | | | | | | | | |
| | | Engineer Generally should be able to | | | | | | | | | | | | In addition, Mechanical Engineer should be able to | | | | | | |
		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19
MEP331	Turbomachinery (1)																X			
MEP351	Power Stations			X															X	
MEP361	Combustion																X		X	
MDP331	Engineering Materials (Advanced)			X	X															
MDP355	Introduction to Mechatronics															X		X		
HUMX32	Project Management													X		X				
EPM334	Electrical Power Engineering														X					
MDP354	Mechanics of Machines (2)										X								X	
MEP362	Internal Combustion Engines (1)																		X	X
MEP381	Automatic Control (1)			X													X			
MDP363	Introduction to Computer-Aided Design & Manufacturing															X				
MEP352	Renewable Energy									X							X			
HUMX21	Management & Marketing										X		X							
MEP431	Turbomachinery (2)																	X		
MEP451	Power Stations																			X

	ILOs	c- Professional and practical skills																	
		Engineer Generally should be able to												In addition, Mechanical Engineer should be able to						
Code	Course Name	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19
MEP471	Refrigeration & Air conditioning																X			
MEP499	Project						X	X						X						
MEP481	Automatic Control																	X		
MDP425	Introduction to Industrial Organization								X	X										
MEP421	Pipelines Networks																	X	X	
HUMX41	Legislations & Contracts								X		X									
MEP461	Internal Combustion Engines (2)																		X	X
MDP426	Introduction in Quality Systems										X									
MEP482	Modelling and Simulation of Thermal Power Systems							X										X		
HUMX42	Environmental Impact of Projects									X		X								

Table [6] The relationship matrix of "**Program's ILOs Vs Program's Courses**"

	ILOs	d- General and Transferable								
		Mechanical Engineer should be able to								
Code	Course Name	D1	D2	D3	D4	D5	D6	D7	D8	D9
PHM011	Mathematics (1)						X			
PHM021	Physics (1)		X					X		
PHM031	Mechanics (1)			X	X					
MDP021	Engineering Drawing & Projection				X					
PHM041	Chemistry	X								
CSE011	Computer Technology		X			X				
MDP022	Production Technology & Engineering History	X		X						
HUMX11	Technical English Language								X	
PHM112	Mathematics (2)						X		X	X
MDP161	Machine Drawing		X			X		X		
PHM122	Physics (2)			X	X					
PHM132	Mechanics (2)					X	X			X
CES112	Theory of Structure	X		X		X				

Table [6] The relationship matrix of "**Program's ILOs Vs Program's Courses**"

Code	Course Name	d- General and Transferable								
		Mechanical Engineer should be able to								
		D1	D2	D3	D4	D5	D6	D7	D8	D9
MDP131	Materials Engineering & Testing						X	X		
EPM112	Electrical & Electronic Engineering	X			X		X			
MDP111	Manufacturing Technology (1)					X				X
MEP111	Thermodynamics (1)					X				
HUMX12	Technical Report Writing							X		
MDP251	Mechanics of Machines (1)					X			X	
MDP252	Machine Construction			X	X					
EPM212	Electrical Engineering				X					X
MDP221	Stress Analysis						X			
MEP212	Thermodynamics (2)	X				X	X			
MEP231	Fluid Dynamics	X								
MDP211	Manufacturing Technology (2)		X					X		
MEP221	Heat & Mass Transfer					X			X	
MEP281	Measurements	X		X						
HUMX31	Engineering Economy	X	X					X		

Table [6] The relationship matrix of "**Program's ILOs Vs Program's Courses**"

| Code | Course Name | d- General and Transferable | | | | | | | | |
| | | Mechanical Engineer should be able to | | | | | | | | |
		D1	D2	D3	D4	D5	D6	D7	D8	D9
MDP362	Machine Construction & Design of Mechanical Equipment				X		X			
MEP331	Turbomachinery (1)					X				X
MEP351	Power Stations	X	X							
MEP361	Combustion				X			X	X	
MDP331	Engineering Materials (Advanced)			X			X			
MDP355	Introduction to Mechatronics		X							X
HUMX32	Project Management		X							
EPM334	Electrical Power Engineering				X					
MDP354	Mechanics of Machines (2)						X			
MEP362	Internal Combustion Engines (1)	X						X		
MEP381	Automatic Control (1)				X				X	
MDP363	Introduction to Computer-Aided Design & Manufacturing			X						X
MEP352	Renewable Energy				X			X		
HUMX21	Management & Marketing							X		X

Table [6] The relationship matrix of "**Program's ILOs Vs Program's Courses**"

Code	Course Name	d- General and Transferable								
		Mechanical Engineer should be able to								
		D1	D2	D3	D4	D5	D6	D7	D8	D9
MEP431	Turbomachinery (2)							X		X
MEP451	Power Stations		X				X			
MEP471	Refrigeration & Air conditioning			X						
MEP499	Project		X		X		X			
MEP481	Automatic Control						X			X
MDP425	Introduction to Industrial Organization					X			X	
MEP421	Pipelines Networks	X				X				
HUMX41	Legislations & Contracts	X					X			
MEP461	Internal Combustion Engines (2)		X			X			X	
MDP426	Introduction in Quality Systems					X		X		
MEP482	Modelling and Simulation of Thermal Power Systems				X					X
HUMX42	Environmental Impact of Projects					X		X	X	

Table [7] Program courses classification according to subject areas

Course Code	Course Name	Cr.H. / Contact H. @ Bylaw	A — Humanities and Social Sciences (Univ. Req.)	B — Mathematics and Basic Sciences	C — Basic Engineering Sciences (Faculty/Spec. Req.)	D — Applied Engineering and Design	E — Computer Applications and ICT*	F — Projects* and Practice	G — Discretionary (Institution character-identifying) subjects
NARS Range			9-12 %	20-26 %	20-23 %	20-22 %	9-11 %	8-10 %	6-8 %
Program Subject area %		300	11	20	20	25	9	9	6
Sum									
PHM011	Mathematics (1)	12		▓					
PHM021	Physics (1)	12		▓					
PHM031	Mechanics (1)	8		▓					
MDP021	Engineering Drawing & Projection	5		▓					
PHM041	Chemistry	3		▓					
CSE011	Computer Technology	6					▓		
MDP022	Production Technology & Engineering History	5			▓				
HUMX11	Technical English Language	2	▓						
PHM112	Mathematics (2)	7		▓					
MDP161	Machine Drawing	12					▓		
PHM122	Physics (2)	8		▓					
PHM132	Mechanics (2)	4		▓					

Table [7] Program courses classification according to subject areas

Course Code	Course Name	Cr.H. / Contact H. @ Bylaw	A — Humanities and Social Sciences (Univ. Req.)	B — Mathematics and Basic Sciences	C — Basic Engineering Sciences (Faculty/Spec. Req.)	D — Applied Engineering and Design	E — Computer Applications and ICT*	F — Projects* and Practice	G — Discretionary (Institution character-identifying) subjects
CES112	Theory of Structure	4			■				
MDP131	Materials Engineering & Testing	4		■					
EPM112	Electrical & Electronic Engineering	8		■					
MDP111	Manufacturing Technology (1)	6			■				
MEP111	Thermodynamics (1)	7		■					
HUMX12	Technical Report Writing	4	■						
MDP251	Mechanics of Machines (1)	3			■				
MDP252	Machine Construction	8			■				
EPM212	Electrical Engineering	8			■				
MDP221	Stress Analysis	4			■				
MEP212	Thermodynamics (2)	4				■			
MEP231	Fluid Dynamics	8				■			
MDP211	Manufacturing Technology (2)	6			■				
MEP221	Heat & Mass Transfer	7				■			
MEP281	Measurements	7				■			
HUMX31	Engineering Economy	5	■						
MDP362	Machine Construction & Design of Mechanical Equipment	3					■		

Table [7] Program courses classification according to subject areas

Course Code	Course Name	Cr.H. / Contact H. @ Bylaw	A Humanities and Social Sciences (Univ. Req.)	B Mathematics and Basic Sciences	C Basic Engineering Sciences (Faculty/Spec. Req.)	D Applied Engineering and Design	E Computer Applications and ICT*	F Projects* and Practice	G Discretionary (Institution character-identifying) subjects
MEP331	Turbomachinery (1)	7				■			
MEP351	Power Stations	6				■			
MEP361	Combustion	4				■			
MDP331	Engineering Materials (Advanced)	6				■			
MDP355	Introduction to Mechatronics	3			■				
HUMX32	Project Management	3	■						
EPM334	Electrical Power Engineering	4			■				
MDP354	Mechanics of Machines (2)	6			■				
MEP362	Internal Combustion Engines (1)	6				■			
MEP381	Automatic Control (1)	6				■			
MDP363	Introduction to Computer-Aided Design & Manufacturing	6					■		
MEP352	Renewable Energy	3						■	■
HUMX21	Management & Marketing	3	■						
MEP431	Turbomachinery (2)	3				■			
MEP451	Power Stations	5							■
MEP471	Refrigeration & Air conditioning	5				■			
MEP499	Project	5						■	

Table [7] Program courses classification according to subject areas

Course Code	Course Name	Cr.H. / Contact H. @ Bylaw	A Humanities and Social Sciences (Univ. Req.)	B Mathematics and Basic Sciences	C Basic Engineering Sciences (Faculty/Spec. Req.)	D Applied Engineering and Design	E Computer Applications and ICT*	F Projects* and Practice	G Discretionary (Institution character-identifying) subjects
MEP481	Automatic Control	8						▓	
MDP425	Introduction to Industrial Organization	5						▓	
MEP421	Pipelines Networks	3						▓	
HUMX41	Legislations & Contracts	5	▓						
MEP461	Internal Combustion Engines (2)	5				▓			
MDP426	Introduction in Quality Systems	3				▓			
MEP482	Modelling and Simulation of Thermal Power Systems	3					▓		▓
HUMX42	Environmental Impact of Projects	3	▓						