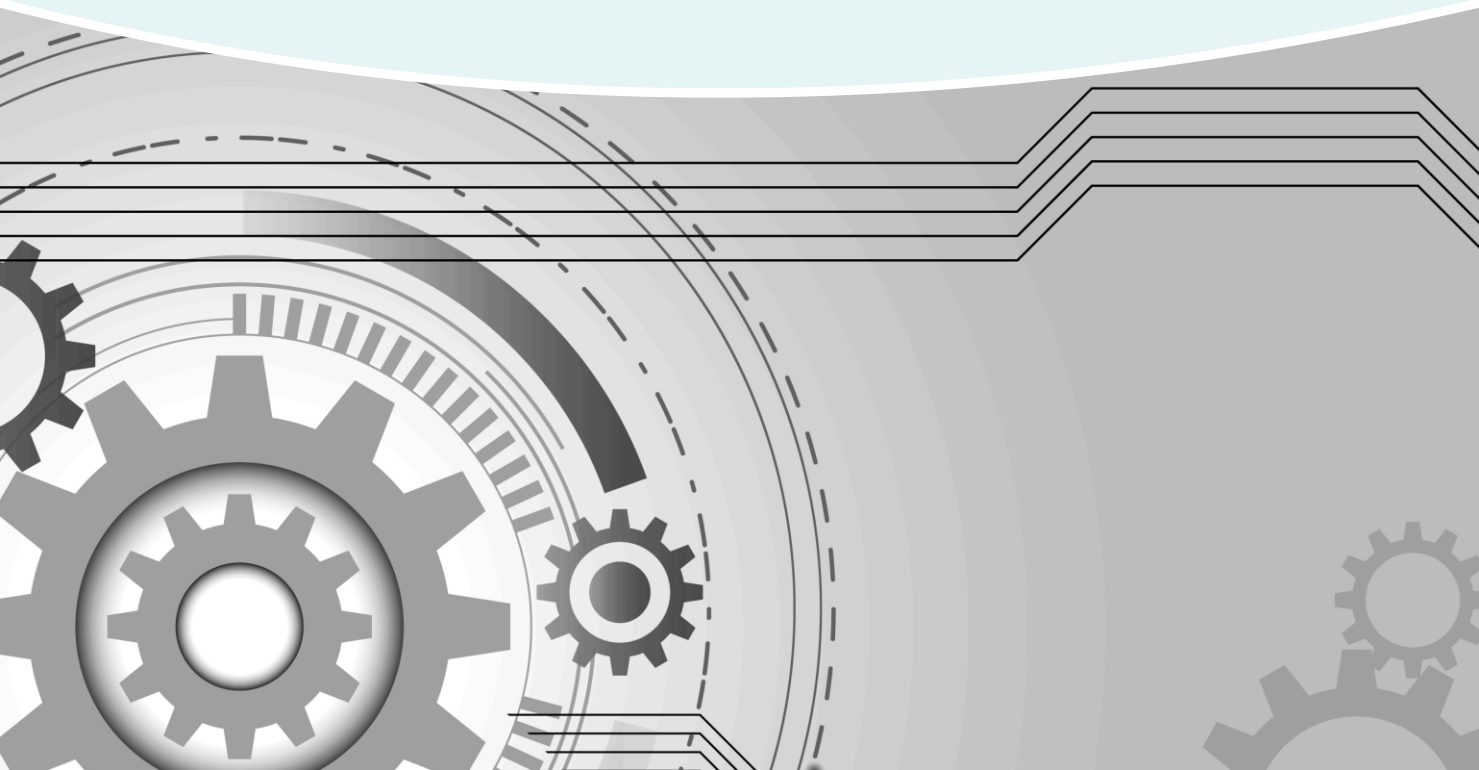


DEPARTMENT OF MECHANICAL ENGINEERING

At Mechanical Engineering department, an excellent educational experience is designed to sharpen the students' talents and skills through a cutting edge course work. Department allows its students to build knowledge across the breadth of the discipline while concentrating in depth, on a particular area of specialization. The infrastructure of the department is pivotal to its vision of multi-disciplinary education and research. It comprises state of the art and well equipped teaching and research laboratories, workshops, lecture halls and faculty offices. The department offers BS degree in Mechanical Engineering, Robotics and intelligent systems along with MS and PhD in Mechanical Engineering, and a MS and PhD degree in Engineering Management with different specializations in all graduate programs.

As Mechanical Engineering is closely intertwined with the industry and business, these programs are aimed to provide opportunities to create industrial linkages and act as a bridge for flow of the cross-disciplinary knowledge among all departments.

The phenomenal growth observed in automobile and aerospace industry, in recent past, is primarily based on the advancement of Mechanical Engineering knowledge. A degree in Mechanical Engineering gives knowledge and skills to be involved in the design, development and manufacturing of products, machines and mechanical engineering systems, including engines and turbines, land transport vehicles, ships, aircrafts, building services (air conditioning, pumps, fans), refrigeration systems, manufacturing processes and industrial plants.





BS Mechanical Engineering

■ Program Educational Objectives (PEOs)

The BS Mechanical Engineering Program aims to produce leading professionals who:

- (i) Applies knowledge and skills to provide sustainable solutions to challenging Mechanical Engineering problems in industry and academia.
- (ii) Demonstrates professional growth and exhibit continual improvement in learning modern engineering techniques and their applications in practice.
- (iii) Makes positive contribution towards society by strong ethical values, communication skills and leadership.

■ Program Learning Outcomes (PLOs)

At the time of graduation, the graduates of BS(ME) program will possess the following attributes:

- (i) **Engineering Knowledge:** An ability to apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
- (ii) **Problem Analysis:** An ability to identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
- (iii) **Design/Development of Solutions:** An ability to design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and

safety, cultural, societal, and environmental considerations.

- (iv) **Investigation:** An ability to investigate complex engineering problems in a methodical way including literature survey, design and conduct of experiments, analysis and interpretation of experimental data, and synthesis of information to derive valid conclusions.
- (v) **Modern Tool Usage:** An ability to create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex engineering activities, with an understanding of the limitations.
- (vi) **The Engineer and Society:** An ability to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solution to complex engineering problems.
- (vii) **Environment and Sustainability:** An ability to understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.
- (viii) **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
- (ix) **Individual and Team Work:** An ability to work effectively, as an individual or in a team, on multifaceted and /or multidisciplinary settings.
- (x) **Communication:** An ability to communicate effectively, orally as well as in writing, on complex engineering activities with the engineering community and with society at large, such as

being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

- (xi) **Project Management:** An ability to demonstrate management skills and apply engineering principles to one's own work, as a member and/or leader in a team, to manage projects in a multidisciplinary environment.
- (xii) **Lifelong Learning:** An ability to recognize importance of, and pursue lifelong learning in the broader context of innovation and technological developments.

■ Admission Requirements

- (i) Higher Secondary School Certificate (F.Sc. Pre-Engineering) or Equivalent with Physics, Chemistry and Mathematics securing at least 60% marks in aggregate.

OR

Intermediate of Computer Science (ICS) or Equivalent with Physics, Computer Science and Mathematics securing at least 60% marks in aggregate.

OR

Diploma of Associate Engineering in relevant disciplines securing at least 60% marks in aggregate.

- (ii) CUST Admission Test/HEC Approved Test

■ Degree Requirements

Each candidate for the BS Mechanical Engineering degree is required to complete successfully 140 credit hours (Cr. Hrs.) as per the following details:

Area	Cr. Hrs.
a) General Education Courses	42
b) Disciplinary or Major Courses	74
c) Interdisciplinary / Allied Courses	15
d) Field Experience / Internship	03
e) Capstone / Design Project	06
f) Community Service	00
Total	140

■ General Education Courses (42 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Calculus and Analytical Geometry	MEG1513	03
Probability & Statistics	MEG2523	03
Applied Physics	MEG1312	02

Applied Physics Lab	MEG1311	01
Function English	MEG1113	03
Expository Writing	MEG1123	03
Islamic Studies/Ethics	MEG1012	02
Fem-ul-Quran I	MEG1021	01
Fem-ul-Quran II	MEG1031	01
Ideology and Constitution of Pakistan	MEG1022	02
Pakistan Studies	MEG1032	2
Personal Grooming	MEG1212	02
Sociology	MEG1412	02
Applications of Information & Communication Technologies	MEG1612	02
Applications of Information & Communication Technologies Lab	MEG1611	01
Civics and Professional Ethics	MEG2812	02
Entrepreneurship	MEG2712	02
Applied Differential Equation	MTME1043	03
Complex Variables & Transforms	MTME2053	03
Project Management	HMME4722	02

■ Disciplinary or Major Courses (74 Cr. Hrs.)

a) Foundation Courses (24 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Engineering Drawing & Graphics	ME1011	1
Engineering Drawing & Graphics Lab	ME1021	1
Workshop-I	ME1801	1
Workshop-II	ME1811	1
Engineering Materials	ME2412	2
Thermodynamics-I	ME1113	3
Engineering Mechanics-I	ME1273	3
Engineering Mechanics-II	ME2282	2
Mechanics of Materials-I	ME2233	3

Fluid Mechanics-I	ME2513	3
Manufacturing Processes	ME3612	2
Engineering Mechanics Lab	ME2221	1
Manufacturing Processes Lab	ME3611	1

b) Breadth Courses (22 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Thermodynamics-II	ME2122	2
Mechanics of Materials-II	ME2242	2
Fluid Mechanics-II	ME2522	2
Machine Design-I	ME3042	2
Mechanics of Machines	ME3032	2
Heat and Mass Transfer	ME3133	3
Machine Design-II	ME3052	2
Control Engineering	EEME4742	2
Thermodynamics Lab	ME2121	1
Mechanics of Materials Lab	ME2241	1
Fluid Mechanics Lab	ME2521	1
CAD Lab	ME2081	1
HVAC and H&M Lab	ME3821	1

c) Depth Courses (22 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Heating, Ventilation and Air Conditioning	ME3183	3
Computer Aided Engineering	ME3092	2
Computer Aided Engineering Lab	ME3091	1
Mechanical Vibrations	ME4253	3
Mechanisms and Mechanical Vibrations Lab	ME4261	1
Internal Combustion Engines	ME4142	2
Internal Combustion Engines Lab	ME4141	1
Reverse Engineering & Inspection Techniques	ME4632	2

Reverse Engineering & Inspection Techniques Lab	ME4631	1
Technical Elective-I	ME4xx3	3
Technical Elective-II	ME4xx3	3

■ *Technical Elective Courses

Students are required to take 06 Cr. Hrs. as technical elective courses. A list of technical elective courses is given below:

Course Title	Code	Cr. Hrs.
Renewable Energy Technology	ME4163	3
Power Plants	ME4173	3
Gas Dynamics	ME4533	3
Aerodynamics	ME4543	3
Machining and Automation	ME4623	3
CAD/CAM	ME4073	3
Computational Fluid Dynamics	ME4553	3
Introduction to Electric and Hybrid Vehicles	ME4703	3
Dynamics of Machinery	ME4273	3
Advanced Manufacturing Technologies	ME4633	3
Industrial Engineering	ME4643	3
Refrigerants and Environment	ME4183	3
Tribology	ME4093	3
Introduction to Biomedical Engineering	ME4783	3

d) Computer and Information Sciences - C&I (06 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Computer System & Programming	CSME1012	2
Computer System & Programming Lab	CSME1011	1
Applied Artificial Intelligence & Machine Learning	ME3792	2
Applied Artificial Intelligence & Machine Learning Lab	ME3791	1

■ Interdisciplinary / Allied Courses (IDC) (15 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Electrical Engineering	EEME2742	2
Electronics Engineering	EEME2752	2
Electrical & Electronics Engineering Lab	EEME3761	1
Instrumentation & Measurement	ME3772	2
IM & Control Lab	EEME4771	1
Occupational Health and Safety	ME4721	1
Linear Algebra & Numerical Analysis	MTME3062	2
Linear Algebra & Numerical Analysis Lab	MTME3061	1
Mechatronics & Robotics Engineering	ME4712	2
Mechatronics & Robotics Engineering Lab	ME4711	1

■ Capstone / Design Project (06 Cr. Hrs.)

After the completion of 90 Cr. Hrs., the students are required to register for Design Project (Part-I) of 3 Cr. Hrs. in the 7th semester of their degree program. Design Project (Part-II) of 3 Cr. Hrs. can be taken in the next i.e. 8th semester provided Design Project (Part-I) is passed.

Course Title	Code	Cr. Hrs.
Design Project (Part-I)	ME4913	03
Design Project (Part-II)	ME4923	03

■ Field Experience / Internship (03 Cr. Hrs.)

Each student is required to complete 8 weeks industrial internship training usually after 6th semesters or on the completion of 90 Cr. Hrs.

Course Title	Code	Cr. Hrs.
Field Experience / Internship	ME4003	03

■ Community Service (VIS4000)

Each student is required to complete 65 hours community work, usually after 1st semester which would be a prerequisite for the award of degree. It will be assessed as satisfactory (S) / unsatisfactory (US). In case of unsatisfactory, it will be done from scratch.

■ CGPA Requirement

A student is required to earn a minimum 2.00/4.00 CGPA on the completion of his/her degree requirements.

■ Program Duration

This is a four year degree program comprising of 8 semesters. There will be a Fall and a Spring semester in each year. The summer semester will be utilized for internship or deficiency courses. The maximum duration to complete BS Mechanical Engineering degree is 07 years.



SCHEME OF STUDIES

BS Mechanical Engineering Program

□ Semester-I (15 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
MEG1513	Calculus and Analytical Geometry	3
MEG1113	Functional English	3
MEG1312	Applied Physics	2
MEG1311	Applied Physics Lab	1
MEG1012	Islamic Studies/ Ethics	2
MEG1612	Applications of Information and Communication Technologies	2
MEG1611	Applications of Information and Communication Technologies Lab	1
ME1801	Workshop Practice-I	1

□ Semester-II (18 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
MTME1043	Applied Differential Equation	3
MEG1123	Expository Writing	3
ME1273	Engineering Mechanics - I	3
ME1011	Engineering Drawing & Graphics	1
ME1021	Engineering Drawing & Graphics Lab	1
ME2412	Engineering Materials	2
ME1113	Thermodynamics-I	3
ME1811	Workshop Practice-II	1
MEG1021	Fehm-ul-Quran I	1

□ Semester-III (18 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
MEG1812	Civics and Community Engagement	2
MEG1022	Ideology and Constitution of Pakistan	2
ME2233	Mechanics of Materials-I	3

ME2081	CAD Lab	1
ME2513	Fluid Mechanics-I	3
ME2122	Thermodynamics-II	2
ME2121	Thermodynamics Lab	1
CSME1012	Computer System & Programming	2
CSME1011	Computer System & Programming Lab	1
MEG1031	Fehm-ul-Quran II	1

□ Semester-IV (16 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
MTME2053	Complex Variables & Transforms	3
ME2282	Engineering Mechanics - II	2
ME2221	Engineering Mechanics Lab	1
ME2242	Mechanics of Materials-II	2
MEG2712	Entrepreneurship	2
ME2522	Fluid Mechanics-II	2
ME2241	Mechanics of Materials Lab	1
EEME2742	Electrical Engineering	2
ME2521	Fluid Mechanics Lab	1

□ Semester-V (18 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
MTME3062	Linear Algebra & Numerical Analysis	2
MTME3061	Linear Algebra & Numerical Analysis Lab	1
ME3032	Mechanics of Machines	2
ME3042	Machine Design-I	2
ME3612	Manufacturing Processes	2
ME3611	Manufacturing Processes Lab	1
MEG1032	Pakistan Studies	2
ME3133	Heat and Mass Transfer	3
EEME2752	Electronics Engineering	2
EEME3761	Electrical Electronics Engineering Lab	1

□ **Semester-VI (18 Cr. Hrs.)**

Course Code	Course Title	Cr. Hrs.
ME3092	Computer Aided Engineering	2
ME3091	Computer Aided Engineering Lab	1
ME4721	Occupational Health & Safety	1
ME3052	Machine Design-II	2
ME3772	Instrumentation & Measurement	2
ME3792	Applied Artificial Intelligence and Machine Learning	2
ME3791	Applied Artificial Intelligence and Machine Learning Lab	1
ME3183	Heating, Ventilation & Air Conditioning	3
ME3821	HVAC and H&M Lab	1
MEG2523	Probability & Statistics	3

□ **Semester-VII (18 Cr. Hrs.)**

Course Code	Course Title	Cr. Hrs.
EEME4742	Control Engineering	2
ME4253	Mechanical Vibrations	3
EEME4771	IM & Control Lab	1
ME4xx3	Technical Elective - I	3
ME4261	Mechanisms and Mechanical Vibrations Lab	1
ME4142	Internal Combustion Engines	2
ME4141	Internal Combustion Engines Lab	1
ME4913	Design Project-I	3
HMME4xx2	Arts & Humanities Elective	2

□ **Semester-VIII (16 Cr. Hrs.)**

Course Code	Course Title	Cr. Hrs.
HMME4722	Project Management	2
ME4632	Reverse Engineering & Inspection Techniques	2
ME4631	Reverse Engineering & Inspection Techniques Lab	1
ME4xx3	Technical Elective - II	3

HMME3xx2	Social Sciences Elective	2
ME4923	Design Project-II	3
ME4712	Mechatronics & Robotics Engineering	2
ME4711	Mechatronics & Robotics Engineering Lab	1



BS Robotics and Intelligent Systems

■ Program Educational Objectives (PEOs)

The BS Robotics and Intelligent Systems Program aims to produce leading professionals who:

- (i) Applies knowledge and skills to provide innovative solutions to challenging problems in the domain of robotics and intelligent systems across industry and academia.
- (ii) Demonstrates professional growth and exhibits continual learning of intelligent robotic systems for research and industrial applications.
- (iii) Makes positive contribution towards society by strong ethical values, communication skills and leadership.

■ Program Learning Outcomes (PLOs)

At the time of graduation, the graduates of BS Robotics and Intelligent Systems program will possess the following attributes:

- (i) **Fundamental Knowledge:** Apply knowledge of mathematics, natural sciences, fundamental and specialized concepts in robotics and intelligent systems to solve complex problems.
- (ii) **Problem Analysis:** Identify, formulate, conduct research literature, and analyze complex problems reaching substantiated conclusions using principles of mathematics, natural sciences, robotics and intelligent systems.
- (iii) **Design/Development of Solutions:** An ability to design systems, components or processes that meet specified needs for sustainable solutions to

complex problems in the field of robotics and intelligent systems.

- (iv) **Investigation:** Conduct investigation of complex problems in the field of robotics and intelligent systems using research-based knowledge and research methods, including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.
- (v) **Modern Tool Usage:** Create, select and apply appropriate techniques, resources, modern design and IT tools, including prediction and modeling, to complex problems in the field of robotics and intelligent systems, with an understanding of the limitations.
- (vi) **The Society and Sustainability:** Analyze and evaluate sustainable development impacts to society, the economy, sustainability, health and safety and legal frameworks while solving complex problems in the field of robotics and intelligent systems.
- (vii) **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of professional practice.
- (viii) **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multi-disciplinary, face-to-face, remote and distributed settings.
- (ix) **Communication:** Communicate effectively and inclusively on complex activities with the community and with society at large, such as being able to comprehend and write effective reports and design documentation, and make effective presentations, taking into account cultural, language, and learning differences.

(x) **Project Management:** Demonstrate knowledge and understanding of project management principles and apply these to one's own work, as a member and leader in a team, to manage projects in multidisciplinary environments.

(xi) **Lifelong Learning:** Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change.

■ Admission Requirements

- (i) Higher Secondary School Certificate or equivalent securing at least 50% marks in aggregate with Mathematics.
- (ii) CUST Admission Test/HEC Approved Test

■ Degree Requirements

Each candidate for the BS Robotics and Intelligent Systems degree is required to complete successfully 136 credit hours (Cr. Hrs.) as per the following details:

Area	Cr. Hrs.
a) General Education Courses	34
b) Disciplinary or Major Courses	73
(c) Elective Courses	06
d) Interdisciplinary / Allied Courses	14
e) Field Experience / Internship	03
f) Capstone / Design Project	06
g) Community Service	00
Total	136

■ General Education Courses (34 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Applications of Information and Communication Technologies	RISG1612	02
Applications of Information and Communication Technologies Lab	RISG1611	01
Basic Mathematics	RISG1593	03
Functional English	RISG1113	03
Entrepreneurship	RISG2712	02
Calculus and Analytical Geometry	RISG1513	03
Applied Physics	RISG1312	02

Applied Physics Lab	RISG1311	01
Personal Grooming	RISG1212	02
Ideology and Constitution of Pakistan	RISG1022	02
Islamic Studies / Ethics	RISG1012	02
Expository Writing	RISG1123	03
Civics and Professional Ethics	RISG2812	02
Sociology	RISG1412	02
Fem-ul-Quran I	RISG1021	01
Fem-ul-Quran II	RISG1031	01
Pakistan Studies	RISG1032	2

■ Disciplinary or Major Courses (73 Cr. Hrs.)

a) Robotics (7 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Introduction to Robotics	RIS1002	02
Robot Operating Systems	RIS4012	02
Robot Operating Systems Lab	RIS4011	01
Robotics Design Lab – I	RIS3031	01
Robotics Design Lab – II	RIS3041	01

b) Computing (14 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Programming Fundamentals	RIS1102	02
Programming Fundamentals Lab	RIS1101	01
Object Oriented Programming	RIS2112	02
Object Oriented Programming Lab	RIS2111	01
Data Structures & Algorithms	RIS2123	03
Data Structures & Algorithms Lab	RIS2121	01
Embedded Systems	RIS4133	03
Embedded Systems Lab	RIS4131	01

c) Mechanical Design (16 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Workshop Practice	RIS1301	01
Engineering Statics	RIS2332	02
Engineering Dynamics	RIS2342	02
Engineering Mechanics Lab	RIS2341	01
Robot Kinematics	RIS3353	03
Robotics Machine Design-I	RIS3362	02
Robotics Machine Design-II	RIS3372	02
Pneumatics and Hydraulics Systems	RIS3382	02

d) Electrical and Electronics (15 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Circuit Analysis	RIS1403	03
Circuit Analysis Lab	RIS1401	01
Basic Electronics	RIS2412	02
Basic Electronics Lab	RIS2411	01
Digital Logic Design	RIS2423	03
Digital Logic Design Lab	RIS2421	01
Electrical Machines	RIS3433	03
Electrical Machines Lab	RIS3431	01

e) Control (10 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Microprocessors & Interfacing	RIS3502	02
Microprocessors & Interfacing Lab	RIS3501	01
Sensors and Actuators	RIS3513	03
Sensors and Actuators Lab	RIS3511	01
Control Engineering	RIS4522	02
Control Engineering Lab	RIS4521	01

f) Intelligent Systems (12 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Machine Learning	RIS3602	02
Machine Learning Lab	RIS3601	01
Deep Learning	RIS4612	02
Deep Learning Lab	RIS4611	01
Computer Vision and Image Processing	RIS3623	03
Intelligent Adaptive Control	RIS4633	03

g) Elective Courses (06 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Aerial Robotics and Drones	RIS4023	03
Industrial Robotics and Digital Manufacturing	RIS4053	03

■ Interdisciplinary / Allied Courses (14 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Computer-Aided Drawing	RIS1311	01
Computer-Aided Design Lab	RIS2391	01
Applied Differential Equation*	RIS2203	03
Linear Algebra*	RIS2213	03
Probability & Statistics*	RIS3223	03
Occupational Health and Safety	RIS3721	01
Total Quality Management	RIS4712	02

* These courses are included in both mathematics and interdisciplinary domains.

■ Capstone / Design Project (06 Cr. Hrs.)

After the completion of 90 Cr. Hrs., the students are required to register for Design Project (Part-I) of 3 Cr. Hrs. in the 7th semester of their degree program. Design Project (Part-II) of 3 Cr. Hrs. can be taken in the next i.e. 8th semester provided Design Project (Part-I) is passed.

Course Title	Code	Cr. Hrs.
Design Project (Part-I)	RIS4913	03
Design Project (Part-II)	RIS4923	03

■ Field Experience / Internship (03 Cr. Hrs.)

Each student is required to complete 8 weeks industrial internship training usually after 6th semesters or on the completion of 90 Cr. Hrs.

Course Title	Code	Cr. Hrs.
Field Experience / Internship	RIS4003	03

■ Community Service (VIS4000)

Each student is required to complete 65 hours community work, usually after 1st semester which would be a prerequisite for the award of degree. It will be assessed as satisfactory (S) / unsatisfactory (US). In case of unsatisfactory, it will be done from scratch.

■ CGPA Requirement

A student is required to earn a minimum 2.00/4.00 CGPA on the completion of his/her degree requirements.

■ Program Duration

This is a four year degree program comprising of 8 semesters. There will be a Fall and a Spring semester in each year. The summer semester will be utilized for internship or deficiency courses. The maximum duration to complete BS Mechanical Engineering degree is 07 years.



SCHEME OF STUDIES

BS Robotics and Intelligent Systems Program

□ Semester-I (15 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
RISG1612	Applications of Information and Communication Technologies	2
RISG1611	Applications of Information and Communication Technologies Lab	1
RIS1002	Introduction to Robotics	2
RISG1593	Basic Mathematics	3
RISG1113	Functional English	3
RISG1312	Applied Physics	2
RISG1311	Applied Physics Lab	1
RIS1301	Workshop Practice	1

□ Semester-II (18 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
RIS1403	Circuit Analysis	3
RIS1401	Circuit Analysis Lab	1
RIS1311	Computer-Aided Drawing	1
RISG2712	Entrepreneurship	2
RISG1513	Calculus and Analytical Geometry	3
RIS1102	Programming Fundamentals	2
RIS1101	Programming Fundamentals Lab	1
RISG1012	Islamic Studies / Ethics	2
RISG1412	Sociology	2
RISG1021	Fehm-ul-Quran-I	1

□ Semester-III (18 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
RIS2412	Basic Electronics	2
RIS2411	Basic Electronics Lab	1
RIS2391	Computer Aided Design Lab	1

RISG1123	Expository Writing	3
RISG1031	Fehm-ul-Quran-II	1
RISG1032	Pakistan Studies	2
RIS2203	Applied Differential Equation	3
RIS2332	Engineering Statics	2
RIS2112	Object Oriented Programming	2
RIS2111	Object Oriented Programming Lab	1

□ Semester-IV (17 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
RIS2423	Digital Logic Design	3
RIS2421	Digital Logic Design Lab	1
RISG1022	Ideology and Constitution of Pakistan	2
RIS2123	Data Structures & Algorithms	3
RIS2121	Data Structures & Algorithms Lab	1
RISG1812	Civics and Community Engagement	2
RIS2341	Engineering Mechanics Lab	1
RIS2342	Engineering Dynamics	2
RISG1212	Personal Grooming	2

□ Semester-V (17 Cr. Hrs.)

Course Code	Course Title	Cr. Hrs.
RIS2213	Linear Algebra	3
RIS3433	Electrical Machines	3
RIS3431	Electrical Machines Lab	1
RIS3031	Robotics Design Lab – I	1
RIS3721	Occupational Health and Safety	1
RIS3362	Robotics Machine Design-I	2
RIS3502	Microprocessors & Interfacing	2
RIS3501	Microprocessors & Interfacing Lab	1
RIS3353	Robot Kinematics	3

□ **Semester-VI (18 Cr. Hrs.)**

Course Code	Course Title	Cr. Hrs.
RIS3223	Probability & Statistics	3
RIS3513	Sensors and Actuators	3
RIS3511	Sensors and Actuators Lab	1
RIS3382	Pneumatics and Hydraulics Systems	2
RIS3041	Robotics Design Lab – II	1
RIS3372	Robotics Machine Design-II	2
RIS3602	Machine Learning	2
RIS3611	Machine Learning Lab	1
RIS3623	Computer Vision and Image Processing	3

□ **Semester-VII (15 Cr. Hrs.)**

Course Code	Course Title	Cr. Hrs.
RIS4913	Final Year Project – I	3
RIS4012	Robot Operating Systems	2
RIS4011	Robot Operating Systems Lab	1
RIS4522	Control Engineering	2
RIS4521	Control Engineering Lab	1
RIS4712	Total Quality Management	2
RIS4133	Embedded Systems	3
RIS4131	Embedded Systems Lab	1

□ **Semester-VIII (15 Cr. Hrs.)**

Course Code	Course Title	Cr. Hrs.
RIS4923	Final Year Project – II	3
RIS4053	Industrial Robotics and Digital Manufacturing	3
RIS4622	Deep Learning	2
RIS4631	Deep Learning Lab	1
RIS4023	Aerial Robotics and Drones	3
RIS4633	Intelligent Adaptive Control	3

MS Mechanical Engineering

■ Admission Requirements

- (i) A minimum of 16 years of education leading to BS/BE in Mechanical Engineering/Aerospace/Avionics or equivalent.
- (ii) Minimum 2.00/4.00 CGPA or 50% marks
- (iii) Admission Test/HEC Approved Test

■ General Education (02 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Fehm-ul-Quran I	ME7021	1
Fehm-ul-Quran II	ME7031	1

■ Mechanical Design

Course Title	Code	Cr. Hrs.
Finite Elements Methods	ME7003	3
Theory of Elasticity	ME7013	3
Experimental Stress Analysis	ME7023	3
Continuum Mechanics	ME7033	3
Advanced Engineering Materials	ME7043	3
Advanced Mechanical Vibration	ME8003	3
Advanced Solid Mechanics	ME8013	3
Fracture Mechanics	ME8063	3
Advanced Mechanical Design	ME8073	3
Theory of Plates and Shells	ME8033	3
Design of Machine Tools	ME8043	3
Tribology	ME8053	3
Engineering Plasticity	ME8083	3
Mechanics of Composite Materials	ME8093	3

■ Degree Requirements

A student admitted in this program will have to complete the degree requirements by following any one of the options given below:

- (i) 24 Cr. Hrs. course work with 2 Cr. Hrs. Fehm-ul-Quran and 6 Cr. Hrs. Thesis
- (ii) 30 Cr. Hrs. course work (10 courses) with 2 Cr. Hrs. Fehm-ul-Quran

The students are required to register courses offered by the department from the list appended below:

Research Methodologies for Engineers	ME7703	3
Optimization Methods for Engineers	ME7713	3
Experimental Methods	ME7723	3
Numerical Methods	ME7733	3
Applied Machine learning for Engineers	ME8713	3
Modelling and Simulation	ME8723	3

■ Thermal Science

Course Title	Code	Cr. Hrs.
Advanced Engineering Thermodynamics	ME7103	3
Internal Combustion Engines	ME7113	3
Thermal Power Generation	ME7123	3
Gas Dynamics	ME7133	3
Energy Conversion	ME7143	3
Combustion	ME7153	3
Conduction Heat Transfer	ME7203	3
Convective Heat Transfer	ME7213	3
Thermal Design of Heat Exchangers	ME7223	3
Radiation Heat Transfer	ME7233	3
Computational Heat Transfer	ME7243	3
Advanced Fluid Mechanics	ME7503	3
Computational Fluid Dynamics	ME7513	3
Fluid Mixing and Separation	ME7523	3
Transport Phenomena	ME7533	3
Viscous Flow	ME7543	3
Thermal Energy Storage	ME8123	3
Fluid Mechanics and Thermodynamics of Turbomachinery	ME8563	3
Solar Energy Utilization	ME8103	3
Energy Management	ME8113	3
Renewable Energy Technologies	ME8133	3

Energy Systems	ME8143	3
Advanced Propulsion	ME8153	3
Advanced Heat and Mass Transfer	ME8203	3
Boiling and Condensation Heat Transfer	ME8213	3
Industrial Air Conditioning and Refrigeration	ME8223	3
Design of Industrial Boilers and Furnaces	ME8233	3
Fuel Cell Technology	ME8243	3
Turbulent Flow	ME8503	3
Boundary Layer Theory	ME8513	3
Two Phase Flow	ME8523	3
Kinetic Theory of Gases	ME8533	3
Theory of Granular Flows	ME8543	3
Aerodynamics	ME8553	3
Research Methodologies for Engineers	ME7703	3
Optimization Methods for Engineers	ME7713	3
Experimental Methods	ME7723	3
Numerical Methods	ME7733	3
Applied Machine learning for Engineers	ME8713	3
Modelling and Simulation	ME8723	3

■ Manufacturing

Course Title	Code	Cr. Hrs.
Computer Integrated Manufacturing	ME7613	3
Mechanism Design	ME7623	3
Automation and Control	ME7633	3
Digital Manufacture and Rapid Manufacture	ME7643	3
Manufacturing System Design and Analysis	ME7653	3
Product Design and Development	ME7663	3
Production Planning and Control	ME7673	3

Operations Research	ME7683	3
Material Selection and Design	ME8603	3
Robotics and Manufacturing Automation	ME8633	3
Advanced CAD/CAM	ME7603	3
Multiple criteria decision-making methods (MCDM)	ME8703	3
Modern Manufacturing Processes	ME8613	3
Gradient Optimization Techniques	ME8623	3
Nano Fabrication and Manufacturing	ME8643	3
Quality Engineering and Management	ME8653	3
Product Life Cycle Management	ME8663	3
Productivity Engineering	ME8673	3
Scheduling and Sequencing	ME8683	3
Theory of Metal Cutting	ME8693	3
Research Methodologies for Engineers	ME7703	3
Optimization Methods for Engineers	ME7713	3
Experimental Methods	ME7723	3
Numerical Methods	ME7733	3
Applied Machine learning for Engineers	ME8713	3
Modelling and Simulation	ME8723	3

■ Research Thesis

Course Title	Code	Cr. Hrs.
Research Thesis	ME8916	6

■ CGPA Requirement

A student is required to earn a minimum 3.00/4.00 CGPA on the completion of his/her degree requirements.

■ Program Duration

This is normally a two year program comprising of 4 semesters. There will be a Fall and a Spring semester in each year. The maximum duration to complete MS in Mechanical Engineering is 4 years.

MS Engineering Management

■ Admission Requirements

- (i) A minimum of 16 years of education leading to BS Degree in Engineering/Applied Sciences or equivalent
- (ii) Minimum 2.00/4.00 CGPA or 50% marks
- (iii) Admission Test/HEC Approved Test

■ General Education (02 Cr. Hrs.)

Course Title	Code	Cr. Hrs.
Fehm-ul-Quran I	EM7021	1
Fehm-ul-Quran II	EM7031	1

■ Manufacturing Management

Course Title	Code	Cr. Hrs.
Manufacturing System Design and Analysis	ME7653	3
Operation Research	EM8323	3
Quality and Productivity Improvement	EM8133	3
Supply Chain Management	EM8343	3
Finance and Accounting for Engineers	EM8213	3
Industrial Safety and Maintenance Management	EM8373	3
Research Methods/Research Methods for Social Sciences	EM8413	3
Manufacturing Strategy	EM8353	3
Production Planning and Control	EM8333	3
Product Design & Development	EM8363	3
Advance Topics in Manufacturing Management	EM8383	3

■ Software Project Management

Course Title	Code	Cr. Hrs.
Software Matrices	EM8513	3
Software Quality Management	EM8523	3

■ Degree Requirements

A student admitted in this program will have to complete the degree requirements by following any one of the options given below:

- (i) 24 Cr. Hrs. course work with 2 Cr. Hrs. Fehm-ul-Quran and 6 Cr. Hrs. Thesis
- (ii) 30 Cr. Hrs. course work (10 courses) with 2 Cr. Hrs. Fehm-ul-Quran

The students are required to register courses offered by the department from the list appended below:

Software Requirements Engineering	EM8533	3
Software Risk and Configuration Management	EM8543	3
Project Management Information Systems	EM8443	3
Competitive Strategies in Technology Management	EM8773	3
Modelling and Simulation	EM8143	3

■ Engineering Project Management

Course Title	Code	Cr. Hrs.
Engineering Management Techniques	EM8113	3
Engineering Project Management	EM8403	3
Project Risk Assessment and Decision Analysis	EM8433	3
Project Scheduling, Planning and Control	EM8463	3
Management of Project Based Organization	MPM8113	3
Project Processes, Planning and Control	MPM8123	3

■ Technology Management

Course Title	Code	Cr. Hrs.
Technology Management	EM8703	3
Innovation in Market Place	EM8713	3
Entrepreneurial Basic Plan Preparation	EM8733	3
Competitive Strategies in Technology Management	EM8773	3
Environmental and Energy Management	EM8763	3
Advance Topics in Technology Engineering	EM8783	3
Managing technology innovations	EM8723	3
Technology and Entrepreneurship	EM8743	3
Transfer of Technology	EM8753	3
Optimization Methods for Engineers	ME7713	3
Multiple Criteria Decision-Making Methods (MCDM)	EM8123	3
Applied Machine learning for Engineers	EM8783	3

■ Construction Management

Course Title	Code	Cr. Hrs.
Advanced Construction Management	CE7803	3
Project Planning and Control	CE7813	3
Advanced Project Management for Construction Projects	CE7823	3
Construction and Safety Management	CE7833	3
Advanced Civil Engineering Practices	CE7843	3
Construction Economics and Financial Management	CE8853	3
Construction Contracts for Civil Engineers	CE8863	3
Sustainability in Construction Projects	CE8873	3
Environment Impact Assessment	CE8723	3

■ Research Thesis

Course Title	Code	Cr. Hrs.
Research Thesis	EM8916	6

■ CGPA Requirement

A student is required to earn a minimum 3.00/4.00 CGPA on the completion of his/her degree requirements.

■ Program Duration

This is normally a two years program comprising of 4 semesters. There will be a Fall and a Spring semester in each year. The maximum duration to complete MS in Engineering Management is 4 years.

Note: The following courses are cross listed with MS Project Management.

Engineering Management	Project Management
Finance & Accounting for Engineers	Financial Management
Project Scheduling, Planning & Control	Project Process, Planning & Control
Engineering Project Management	Advanced Project Management
Project Risk Assessment & Decision Analysis	Project Risk Management

Note: The following courses are cross listed with MS Civil Engineering.

Engineering Management	Civil Management
Project Scheduling, Planning & Control	Project Planning & Control
Project Risk Assessment & Decision Analysis	Project Risk Management
Engineering Project Management	Advanced Project Management for Construction Projects
Finance & Accounting for Engineers	Construction Economics & Financial Management



PhD Mechanical Engineering

The PhD program in Mechanical Engineering is designed to deliver students a broad background in mechanical engineering and related technologies. The program mission is to impart knowledge through a comprehensive and advanced curriculum followed with intense research training so that the graduating PhDs are fully prepared for industrial and technological challenges of future. The students are expected to tackle complex engineering and technological problems through a professional approach by utilizing advanced tools and techniques under the guidance of professional, dedicated and research focused faculty members.

Mechanical engineering department provides students the opportunity to conduct research in Mechanical Design; Thermo-fluids and Manufacturing system. The Department has a close liaison with the industry and R&D organizations to support and foster research activities.

■ Admission Requirements

- (i) MS degree in relevant discipline

- (ii) Minimum CGPA 3.0/4.0 (Semester System) or 60% marks (Annual System)
- (iii) Admission Test/HEC Approved Test
- (iv) Interview

■ Degree Requirements

A PhD candidate shall be awarded degree on successful completion of the following requirements:

- (i) 20 Cr. Hrs. Course Work with minimum CGPA 3.00/4.00
- (ii) Comprehensive Examination (written and oral)
- (iii) 30 Cr. Hrs. Research Work
- (iv) Synopsis Defense
- (v) Dissertation Foreign Reviews
- (vi) Publication/Acceptance of at least one research paper in HEC approved journal.
- (vii) Dissertation Final Defense

Note: PhD scholars are required to comply with the following timeline:

Activity	Preferred Time	Maximum
Course Work	2 Semesters	3 Semesters
Comprehensive Exam	3 Semesters	5 Semesters
Synopsis Qualification	4 Semesters	6 Semesters
Thesis Submission	6 Semesters	10 Semesters

PhD Engineering Management

The PhD program in Engineering Management is a rigorous and interdisciplinary academic journey, providing students with advanced knowledge and skills to succeed as leaders in the ever-evolving field. The program offers cutting-edge research opportunities, specialized training, and a focus on practical application, allowing students to contribute to the advancement of theory and practice. The program covers various specializations such as Industrial Engineering, Project Management, Supply Chain Management, Manufacturing Systems Management, Construction Management, Software/ Information Project Management, Technology and Innovation Management, and Total Quality Management.

■ Admission Requirements

- (i) MS degree in relevant discipline
- (ii) Minimum CGPA 3.0/4.0 (Semester System) or 60% marks (Annual System)

- (iii) Admission Test/GAT General/HEC Test
- (iv) Interview

■ Degree Requirements

A PhD candidate shall be awarded degree on successful completion of the following requirements:

- (i) 20 Cr. Hrs. course work with minimum CGPA 3.00/4.00
- (ii) 2 Cr. Hrs. Fehm-ul-Quran
- (iii) Comprehensive Examination
- (iv) 30 Cr. Hrs. Research Work
- (v) Synopsis Defense
- (vi) Dissertation Foreign Reviews
- (vii) Publication of at least one research paper in HEC approved journal.
- (viii) Dissertation Final Defense

Note: PhD scholars are required to comply with the following timeline:

Activity	Preferred Time	Maximum
Course Work	2 Semesters	3 Semesters
Comprehensive Exam	3 Semesters	5 Semesters
Synopsis Qualification	4 Semesters	6 Semesters
Thesis Submission	6 Semesters	12 Semesters



