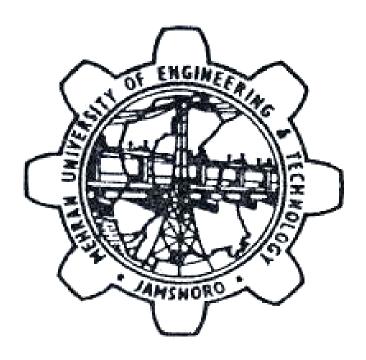# MEHRAN UNIVERSITY

OF

ENGINEERING AND TECHNOLOGY

JAMSHORO

CURRICULUM

FOR

BACHELOR'S DEGREE

IN

MECHATRONIC ENGINEERING

(wef 22 batch)

DEPARTMENT OF MECHATRONIC ENGINEERING

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF MECHATRONIC ENGINEERING

First Semester

S.#.	Course Codes	Name of Subject	Credit Hours		Marks	
			Th.	Pr.	Th.	Pr.
1	MTH108	Applied Calculus	3	0	100	0
2	ENG101	Functional English	3	0	100	0
3	EL117	Applied Physics	2	1	50	50
4	ME107	Engineering Statics	2	1	50	50
5	ME117	Engineering Materials	2	0	50	0
6	ME127	Engineering Drawing	0	2	00	100
Total			**16**		**350**	**200**

Second Semester

S.#.	Course Codes	Name of Subject	Credit Hours		Marks	
			Th.	Pr.	Th.	Pr.
1	ME147	Workshop Practice	0	2	00	100
2	IS111 / SS104	Islamic Studies / Ethics	2	0	50	0
3	PS106	Pakistan Studies	2	0	50	0
4	MTH112	Linear Algebra and Analytical Geometry	3	0	100	0
5	EL125	Linear Circuit Analysis	2	1	50	50
6	CS110	Introduction to Computing and Programing	2	1	50	50
Total			**15**		**300**	**200**

Third Semester

S.#.	Course Codes	Name of Subject	Credit Hours		Marks	
			Th.	Pr.	Th.	Pr.
1	ME207	Mechanics of Materials	2	1	50	50
2	ME216	Engineering Dynamics	3	0	100	0
3	CS291	Data Structures and Object Oriented Programming	2	1	50	50
4	ES247	Electronic Devices and Circuits	3	1	100	50
5	MTH227	Ordinary and Partial Differential Equations	3	0	100	0
6	ENG201	Communication Skills	2	0	50	0
Total			**18**		**450**	**150**

Fourth Semester

S.#.	Course Codes	Name of Subject	Credit Hours		Marks	
			Th.	Pr.	Th.	Pr.
1	MTH217	Laplace Transforms and Discrete Mathematics	3	0	100	0
2	MTE236	Fluid Mechanics	2	1	50	50
3	ES217	Digital Logic Design	2	1	50	50
4	ME237	Mechanics of Machines	2	1	50	50
5	MTE212	Instrumentation and Measurements	3	1	100	50
Total			**16**		**350**	**200**

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF MECHATRONIC ENGINEERING

Title of Subject	:	**APPLIED CALCULUS**			
Course Code	:	**MTH 108**			
Semester	:	**FIRST**	**Year**	:	**FIRST**
Discipline	:	MECHATRONIC ENGINEERING	**Discipline Code**		MTE
Effective	:	22 Batch and onwards			

	:	**Theory**	**Practical**
Assessment		20% Sessional Work, 30% Mid Semester Examination 50% Final Written Examination	------------,
Credit Hours	:	**Theory** 03	**Practical** 00
Marks	:	**Theory** 100	**Practical** 00

After Completing the "Applied Calculus" Course, each student will be able to:

CLO No.	CLO	Domain	Taxonomy Level	PLO
	THEORY			
1.	Evaluate the functions and their derivatives.	Cognitive	2	2
2.	Assess the Integral calculus with applications	Cognitive	3	3
3.	Apply the vector calculus in the field of engineering	Cognitive	3	3

Contents:

Introduction to functions: Mathematical and physical meaning**,** types of function and their graphs.
Introduction to limits: Theorems of limits and their applications to functions. Right hand and left hand limits. Continuous and discontinuous functions and their applications.
Derivatives: Introduction to derivatives. Geometrical and physical meaning of derivatives. Partial derivatives and their geometric significance. Application problems (rate of change, marginal analysis).
Higher Derivatives: Leibnitz theorem, Rolle's theorem, Mean value theorem. Taylors and Maclaurins series.
Evaluation of limits using L' Hospital's rule: Indeterminate forms $(0/0)$, (∞/∞), $(\text{o}x\infty)$, $(\infty-\infty)$, 1^{∞}, ∞^0, 0^0.
Application of Derivatives: Asymptotes, curvature and radius of curvature, differentials with application.
Application of partial Derivatives: Euler's theorem, total differentials; maxima and minima of function of two variables.
Integral Calculus: Methods of integration by substitution and by parts. Integration of rational and irrational algebraic functions. Definite integrals, improper integrals. Gamma and Beta functions; reduction formulae.
Application of Integral Calculus: Cost function from marginal cost, rocket flights; area under curve.
Vector Calculus: Vector differentiation and vector integration with their physical interpretation and applications. ∇ operator, gradient, divergence and curl with their application.

    A. Textbooks

        1. Prof. Muhammad Urs Shaikh; Applied Calculus, latest edition.
        2. Dr. S. M. Yousuf; Calculus And Analytic Geometry, latest edition.

    B. Reference Books
        1. Bittinger; Calculus And Its Applications, latest edition.
        2. Ron Larson, Bruce Edwards; Calculus Of A Single Variable, latest edition.
        3. Margaret L. Lial; Calculus With Applications; Pearson, latest edition.

Approval:	SR.#	Approval Authority	Resolution No.	Dated
	01	Board of studies	01	26/03/2018
	02	Board of FOST&H	3.1	11/04/2018
	03	Academic Council	17(ii)	23/04/2018

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF MECHATRONIC ENGINEERING

Title of Subject	:	**FUNCTIONAL ENGLISH**			
Course Code	:	**ENG101**			
Semester	:	**FIRST**	**Year** :	**FIRST**	
Discipline	:	MECHATRONIC ENGINEERING	**Discipline Code**	MTE	
Effective	:	22 Batch and onwards			
Assessment	:	**Theory** 20% Sessional Work, 30% Mid Semester Examination 50% Final Written Examination	**Practical** -------------		
Credit Hours	:	**Theory** 03	**Practical**	00	
Marks	:	**Theory** 100	**Practical**	00	

After Completing the "Functional English" Course, each student will be able to:

CLO No.	CLO	Domain	Taxonomy Level	PLO
	THEORY			
1.	Write varied contents including official letters, e-mails, and applications and summarize the texts using appropriate grammatical mechanisms and cohesive devices.	Cognitive	6	10
2.	Apply skimming, scanning and detailed reading and listening strategies to understand gist of the text/conversation.	Cognitive	3	2
3.	Debate and reflect their point of view, show arguments and deliver presentations in real life situations.	Cognitive	5	12

Contents:

Reading: Interactive Reading, Apply the skills of surveying, skimming, scanning and detailed reading and identify topic sentence.

Writing: Audience related writing, composition of sentences, paragraphs, short descriptive writing, précis and letter and application, identify contextual clues with the help of cohesive devices.

Listening: Collect gist and important points from listening text or any other oral source viz. lecture, speech or conversation.

Speaking: Taking part in different real-life situations, answer question, argue and explain one's point of view, ask for information, turn taking techniques and presentation skills.

Grammar: Mechanics of English language, punctuation, conservation words, tenses and sentence structure.

Vocabulary: **Matching vocabulary items with their corresponding definitions, identification odds items out of a list of vocabulary items, classification of vocabulary items in lexical sets.**

Recommended books:
A. Textbooks

1. Thomson A. J. and Mrtenet A. V. "A Practical English Grammar",latest edition..
2. SarwarZakia, "English Study Skills", A Spelt Publication Karachi, latest edition.
3. R. R. Jordon, " Collins Study Skills in English", William Collins Sons and Co. Glasgow Great Britain latest edition

B. Reference Books

1. Jones Rhodri, "A New English Course (An Approach to GCSE English Language for Individual Study or Class Use), latest edition.
2. K James et al, "Listening Comprehension and Note-Taking Cours" in Collins Study Skills in English, latest edition

C. Recommended Materials

1. S. Jannifer, "Grammar in Practice 1 and 2", OUP, latest edition.
2. S. Michael, "Basic English Usage", OUP, latest edition.
3. S. Michael, "Practical English Usage", OUP, latest edition

Approval:	**SR.#**	**Approval Authority**	**Resolution No.**	**Dated**
	01	Board of studies (CELL)	01	21-11-2019
	02	Board of Faculty (FoST&H) (1st/2017)		19-07-2021
	03	Academic Council		24-08-2021

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF MECHATRONIC ENGINEERING

Title of Subject	:	**APPLIED PHYSICS**		
Course Code	:	**EL117**		
Semester	:	**FIRST**	**Year** :	**FIRST**
Discipline	:	MECHATRONIC ENGINEERING	**Discipline Code**	MTE
Effective	:	22Batch and onwards		

		Theory	Practical
Assessment	:	20% Sessional Work, 30% Mid Semester Examination 50% Final Written Examination	50% Sessional Work, -------------, 50% Final Lab. Examination
Credit Hours	:	**Theory** 02	**Practical** 01
Marks	:	**Theory** 50	**Practical** 50

After Completing the "Applied Physics" Course, each student will be able to:

CLO No.	CLO	Domain	Taxonomy Level	PLO
	THEORY			
1.	Discuss the basic electrical laws and concepts, and fundamental laws of electrostatic.	Cognitive	2	1
2.	Explain the fundamental knowledge of magnetism and alternating current systems.	Cognitive	2	2
	PRACTICAL			
1.	Reproduce and experimentally validate the basic laws of physics	Psychomotor	3	5
2.	Demonstrate teamwork skills/ ability to collaborate by working in groups on a laboratory experiment	Affective	4	9
3.	Construct electric circuits for a given set of constraints	Cognitive	5	4

Contents:

BASIC CONCEPTS AND LAWS
Electrical quantities, sources of electricity, effects of electric current, basic circuit elements, Series and parallel circuits, voltage and current divider rules resistive bridges and ladders, Ohm's law. Kirchhoff's laws,

ELECTROSTATICS AND CAPACITANCE
Coulomb's law. Electric charge. Electric field. Electric field strength and Electric Flux. Electric potential. Dielectric. Capacitance. Charging and Discharging of Capacitor. Capacitors in series and in parallel. Energy stored in capacitor.

ELECTROMAGNETISM
Magnetic fields. Characteristic of lines of magnetic flux. Magnetic fields due to currents. Electromagnet. Force on current carrying conductor in magnetic field. Electromagnetic induction. Magneto-motive force. Permeability. Reluctance. Self-inductance. Inductance of a coil, Air core and Iron cored inductor. L/R Time constant. Energy stored in inductance. Mutual inductance. Principle of transformer. Principles of dc generator and motor.

AC FUNDAMENTALS
Instantaneous, RMS or effective, average and maximum values of current & voltage for sinusoidal signal wave forms. Form factor and Peak factor of alternating waveforms.

Recommended books:

A. Textbooks

    1 Electrical technology, Edward Hughes ,Longman Latest edition,

    2 Basic Electrical Engineering, V.K.Mehta, Rohit Mehta, latest Edition.

    3 D. Halliday, R. Resnick, J. Walker, Fundamentals of Physics Extended, Latest edition.

B. Reference Books

    1 Principles of Electrical Engg.,B.R Gupta ,S. Chand and Company Ltd. India, Latest Edition.

Approval:

SR.#	Approval Authority	Resolution No.	Dated
01	Board of studies	5.02	11/05/2022
02	Board of Faculty	41.8	02/06/2022
03	Academic Council	104.7 (i)	29/07/2022

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF MECHATRONIC ENGINEERING

Title of Subject	:	**ENGINEERING STATICS**			
Course Code	:	**ME107**			
Semester	:	**FIRST**	**Year** :	**FIRST**	
Discipline	:	MECHATRONIC ENGINEERING	**Discipline Code**	MTE	
Effective	:	22 Batch and onwards			
	:	**Theory**		**Practical**	
Assessment		20% Sessional Work,		50% Sessional Work,	
		30% Mid Semester Examination		-------------,	
		50% Final Written Examination		50% Final Lab. Examination	
Credit Hours	:	**Theory** 02		**Practical** 01	
Marks	:	**Theory** **50**		**Practical** 50	

After Completing the "Engineering Statics" Course, each student will be able to:

CLO No.	CLO	Domain	Taxonomy Level	PLO
	THEORY			
1.	Determine Resultant of force vectors in a plane or space using Scalar and Vector approach.	Cognitive	3	1
2.	Investigate equilibrium of particles & rigid bodies and frictional forces.	Cognitive	4	2
	PRACTICAL			
1.	Perform experiments involving equilibrium friction and cables.	Psychomotor	4	4
2	Follow instructions provided for conduct of experiments.	Affective	2	9

Contents:

Force System: Introduction to the subject, fundamental concepts of statics, representation & types of vectors, principle of transmissibility, graphical & analytical methods of vector operation, rectangular and non-rectangular components, Cartesian vector, and position vector.

Equilibrium of Particle: Free body diagram of particle in equilibrium, equilibrium of particle for 2D and 3D systems.

Force System Resultants: Moment of a force (scalar and vector formulation), moment of force about a specified axis, moment of a couple, resultant of a force and couple systems.

Equilibrium of Rigid Bodies: Free body diagram of rigid bodies in equilibrium, equilibrium of rigid bodies for 2D and 3D systems. **Centroid and Center of gravity**

Friction: Characteristics of dry friction, laws of friction, angle of friction, angle of repose, static and dynamic friction, friction on horizontal and inclined planes.

Recommended books:
   A. Textbooks
      1. R.C. Hibbeler, "Engineering Mechanics (Statics)",Prentice Hall PTR, latest edition.
   B. Reference Books
      1. Beer and Johnston, "Vector Mechanics for Engineers (Statics)", McGraw-Hill, latest edition.
      2. J.L Meriam, "Engineering Mechanics (Statics)", Wiley Global Education, latest edition.

Approval:

SR.#	Approval Authority	Resolution No.	Dated
01	Board of studies	5.02	11/05/2022
02	Board of Faculty	41.8	02/06/2022
03	Academic Council	104.7 (i)	29/07/2022

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF MECHATRONIC ENGINEERING

Title of Subject	:	**ENGINEERING MATERIALS**		
Course Code	:	**ME117**		
Semester	:	**FIRST**	Year :	**FIRST**
Discipline	:	MECHATRONIC ENGINEERING	**Discipline Code**	MTE
Effective	:	22 Batch and onwards		

		Theory	**Practical**
Assessment	:	20% Sessional Work, 30% Mid Semester Examination 50% Final Written Examination	-------------

Credit Hours	:	**Theory**	02	**Practical**	00
Marks	:	**Theory**	50	**Practical**	00

After Completing the "Engineering Materials" Course, each student will be able to:

CLO No.	CLO	Domain	Taxonomy Level	PLO
	THEORY			
1.	Classify and characterize materials on the basis of their properties.	Cognitive	2	1
2.	Analyze the effect of heat treatment on metals.	Cognitive	4	2
3.	Identify metals, polymers, ceramics and composites with harmful effects on environment and propose their control.	Cognitive	1	7

Contents:

Material Classification:
Classification of Engineering Materials, Metals and Alloys, Ceramics, Polymers, Composites, Semiconductors, Magnetic Materials, Piezoelectric Materials, Materials for mechatronics.

Materials Characterization:
Engineering Properties of Materials, Microstructure, Scanning Probe electron microscopy, Non-Destructive Testing, Hardness, Tensile Test, Creep Test, Fatigue Test, Material Selection for Mechatronic systems

Heat treatment:
Annealing, Normalizing, Tempering, Quenching, Hardening

Recommended books:

A. Textbooks
 1. W. D. Callister, "Material Science and Engineering An Introduction", John Wiley & Sons, latest edition.
 2. D. R. Askeland, P.P. Fulay& W. J. Wright, "The Science and Engineering of Materials", Global Engineering, latest edition.
 3. James F. Shackelford "Introduction to Materials Science for Engineers" Pearson, latest edition.

B. Reference Books
 1. L. H. Van Vlack, Addison, "Elements of Material Science and Engineering", latest edition.
 2. P. C. Powell, Chapman and Hall, "Engineering with Polymers", latest edition.

Approval:

SR.#	Approval Authority	Resolution No.	Dated
01	Board of studies	5.02	11/05/2022
02	Board of Faculty	41.8	02/06/2022
03	Academic Council	104.7 (i)	29/07/2022

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF MECHATRONIC ENGINEERING

Title of Subject	:	**ENGINEERING DRAWING**			
Course Code	:	**ME127**			
Semester	:	**FIRST**		Year :	**FIRST**
Discipline	:	MECHATRONIC ENGINEERING		**Discipline Code**	MTE
Effective	:	22 Batch and onwards			
	:	**Theory**		**Practical**	
Assessment		------------		50% Sessional Work, ------------, 50% Final Lab. Examination	
Credit Hours	:	**Theory**	00	**Practical**	02
Marks	:	**Theory**	00	**Practical**	100

After Completing the "Engineering Drawing" Course, each student will be able to:

CLO No.	CLO	Domain	Taxonomy Level	PLO
	PRACTICAL			
1.	Construct engineering drawings.	Psychomotor	4	3
2.	Follow instructions provided for conduct of experiments.	Affective	2	9

Contents:

Engineering drawing:
Introduction to Engineering Drawing, Types of lines and usage, Basic geometrical Constructions, Theory of Orthographic projection; First angle and third angle projections. Dimensioning and lettering, Tolerances, Fits, Projections of points, straight lines, planes and solids. Sectioning of solids, Isometric projections, Development of surfaces, Drawing symbols.

CAD Packages:
Introduction to CAD tool, Understanding and drawing simple 2D objects, Coordinate systems, Modifying drawing objects. Drawing in layers, creating complex drawings, Sectioning, Hatching, Text, Blocks, Dimensioning, Isometric views, Fits and Tolerance, Symbols for welding, Surface finish, Threaded parts, electronics, Solids and surfaces, Extracting views from model space into paper space, Creating layouts in Paper space, Plotting a drawing, Plotting from model space.

Recommended books:

A. **Textbooks**
   1. Frederick E. Giesecke, Alva E. Mitchell, Henry C. Spencer, etal "Technical Drawing with Engineering Graphics", latest Edition
   2. Theodore J. Branoff, "Interpreting engineering Drawings" latest Edition
   3. Paul Ross Wallach "Fundamentals of Modern Drafting", latest Edition

   Reference Books
B. 1. T. E. French, C. J. Vierck, R. J. Foster, "Engineering Drawing and Graphic Technology", latest edition
   2. CAD Packages by T.F. French
   3. Dennis Maguire, "Engineering Drawing from First Principles. Using Auto_Cad", latest edition

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	SR.#	Approval Authority	Resolution No.	Dated
Approval:	01	Board of studies	5.02	11/05/2022
	02	Board of Faculty	41.8	02/06/2022
	03	Academic Council	104.7 (i)	29/07/2022

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF MECHATRONIC ENGINEERING

Title of Subject	:	**WORKSHOP PRACTICE**			
Course Code	:	**ME147**			
Semester	:	**SECOND**	**Year** :	**FIRST**	
Discipline	:	MECHATRONIC ENGINEERING	**Discipline Code**	MTE	
Effective	:	22 Batch and onwards			
Assessment	:	**Theory**		**Practical**	

------------	50% Sessional Work, ------------, 50% Final Lab. Examination

Credit Hours	:	**Theory**	00	**Practical**	02	
Marks	:	**Theory**	00	**Practical**	100	

After Completing the "Workshop Practice" Course, each student will be able to:

CLO No.	CLO	Domain	Taxonomy Level	PLO
	PRACTICAL			
1.	Perform basic workshop operations.	Psychomotor	4	5
2.	Follow instructions provided for conduct of experiments.	Affective	2	9

Contents:

Precautions and safety rules.
Introduction to machine tools, classification and their operations.
Followings Hands-on experiments:

- **Bench fitting:** measuring tools, assembly tools, layout tools, filing, sawing, tap & die practice
- **Wood working:** Its kinds and uses, seasoning of wood and tools for wood working.
- **Forging:** Forging tools, types of forging, heat treatment furnaces.
- **Foundry:** Molding and its types, molding tools, molding sands, melting furnaces, types of casting defects & its remedies.
- **Machine tools:** Lathe, Shaper, Milling, Drilling press, basic and elementary tools used in machine Shop.

Recommended books:

A. Textbooks
   1. Kempster, "Workshop Technology",latest edition.
   2. H.D Burghardt "Machine Tools Operation", latest edition.

B. Reference Books
   1. R.A Higgins, "Engineering Metallurgy", latest edition.
   2. W.D Wolansky, "Wood Working Fundamentals", latest edition.
   3. Odams Boo, "General Engineering Workshop Practice", latest edition.

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Approval:	**SR.#**	**Approval Authority**	**Resolution No.**	**Dated**
	01	Board of studies	5.02	11/05/2022
	02	Board of Faculty	41.8	02/06/2022
	03	Academic Council	104.7 (i)	29/07/2022

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF MECHATRONIC ENGINEERING

Title of Subject	:	**ISLAMIC STUDIES**				
Course Code	:	**SS 111**				
Semester	:	**SECOND**		**Year**	:	**FIRST**
Discipline	:	MECHATRONIC ENGINEERING		**Discipline Code**		MTE
Effective	:	22 Batch and onwards				
Assessment	:	**Theory**		**Practical**		

20% Sessional Work,
30% Mid Semester Examination   ------------
50%   Final Written Examination

Credit Hours	:	**Theory**	02	**Practical**		00
Marks	:	**Theory**	50	**Practical**		00

After Completing the "Islamic Studies" Course, each student will be able to:

CLO No.	CLO	Domain	Taxonomy Level	PLO
	THEORY			
1.	Effectively maintained his/her identity in a multicultural world	Affective	2	6
2.	Find solutions to his/her problems from own cultural practices, rather than be influenced by external ideologies.	Affective	3	8
3.	Know why Muslims fail to equip themselves with essential survival tools needed in the world today.	Affective	2	12

Contents:

Quran and Uloomul Quran: Surah Al-Hujurat., Surah Al-Furqan (These both surahs cover all topics related to ethical values of Islamic society including Taqwa, Taqwa, Simplicity, Lawful earning, Social Justice, Rights of Parents, elders, neighbors, Fear of Allah and Truthfulness), Excellence of Holy Quran (Aijazul Quran), History of collection and compilation of Holy Quran.

Basic Beliefs of Islam: Tauheed, its importance, effects on the life of believer, shirk and its types, Existence of Angles, Holy Scriptures, Prophethood, its need and necessities, characteristics and Finality of Prophethood, Concept on life hereafter.

Life history of Holy Prophet Muhammad (ﷺ): Life history at Makkah (Before Prophethood), Life history at Makkah (after Prophethood), Life history at Madina {including Brotherhood, Charter of Madina, Victory of Makkah and Last Sermon of Holy Prophet Muhammad (ﷺ), Importance of Hadith and Sunnah, Ten selected Ahadiths (Covering topics related to Proper usage of time, Hospitality, quality of shyness, love and affection to humanity, facilitate to others and tolerance etc).

Fundamentals of Islam: Testifying KalimaShahadah, Prayer, its importance, pre-conditions, obligations and effects, Zakat, its aims & objectives, Requirements, Legal recipients, Nisab and benefits, Fasting, its philosophy, requirements and benefits, Pilgrimage, requirements, types, obligations, procedure and benefits, Jihad and its types.**Islam and Science:** Quran and Science, Importance of science and technology in Islam, Historical contribution of Islam and Muslims in the development of science, Verses of Holy Quran those cover different fields of science e.g. social, management and natural science.

Recommended books:

    A. Textbooks
1. A.A. Umrani, Islam: The universal Religion, latest edition.
2. A.Q. Natiq, Sirat-e-Mustaqeem, latest edition.

    B. Reference Books
1. S.M. Saeed, Islam aur HamariZindagi, latest edition.
2. M. Shabudden, Quran Science and Muslims, Al Maktabah Al Ashrafiya, latest edition.

Approval:

SR.#	Approval Authority	Resolution No.	Dated
01	Board of studies	01	26/03/2018
02	Board of Faculty	3.1	11/04/2018
03	Academic Council	17(ii)	23/04/2018

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF MECHATRONIC ENGINEERING

Title of Subject	:	**ETHICS**			
Course Code	:	**SS 104**			
Semester	:	**SECOND**	Year	:	**FIRST**
Discipline	:	MECHATRONIC ENGINEERING	**Discipline Code**	MTE	
Effective	:	22 Batch and onwards			
Assessment	:	**Theory**	**Practical**		
		20% Sessional Work,			
		30% Mid Semester Examination	-------------		
		50% Final Written Examination			
Credit Hours	:	**Theory** 02	**Practical**	00	
Marks	:	**Theory** 50	**Practical**	00	

After Completing the "Ethics" Course, each student will be able to:

CLO No.	CLO	Domain	Taxonomy Level	PLO
	THEORY			
1.	Create stable and healthy civilized atmosphere.	Affective	2	6
2.	Develop uniformity of moral beliefs and behavior.	Affective	2	8, 12

Contents:

Ethics: Definition of Ethics, Position of ethics in different religions.
Islam: Introduction, Role of Beliefs and Arakans in character building, Rights of Non-Muslim, Ill effects of corruption and respect of law.
Hinduism: Introduction, Role of doctrines in character building, Religious books, Concept of Re-Birth and its influence in social life, Celebration days and their social effects, Comparative study of cast systems in the contemporary atmosphere.
Buddhism: Introduction, Doctrines, Eight Nobel Paths of Buddha and its benefits, Critical study on concept of Renunciation of material & worldly life.
Christianity: Introduction, Doctrines, Religious books, Celebration days.
Judaism: Introduction, Doctrines, Religious books, Ten Commandments of Moses and its importance in social life.
Moral values of different religions: Patience, Modesty, Moderation, Tawakal, Taqwa, Lawful earning, Sincerity, Positivity, Forgiveness and Softening.
Bad morals: lying, pride, selfishness, Fame, Greed, Extravagantness, Bribe, Social injustice, Religious biasness and Discrimination on the basis of race, color and faith

Recommended books:

A. Textbooks
1. Dr. A Rasheed, Comparative Study of Religions Tahir sons, latest edition.
2. AadilFaraz, IkhlaqiyatMazahib-e-AalamkiNazar main, latest edition.

B. Reference Books
1. Jeoge D. Chryssides, the study of religions – an introduction to key ideas and methods, latest edition.
2. Ghulam Rasool Cheema Mazahib Aalam ka Mutalia, latest edition.

Approval:

SR.#	Approval Authority	Resolution No.	Dated
01	Board of studies	01	26/03/2018
02	Board of Faculty	3.1	11/04/2018
03	Academic Council	17(ii)	23/04/2018

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF MECHATRONIC ENGINEERING

Title of Subject	:	**PAKISTAN STUDIES**			
Course Code	:	**PS 106**			
Semester	:	**SECOND**		**Year** :	**FIRST**
Discipline	:	MECHATRONIC ENGINEERING		**Discipline Code**	MTE
Effective	:	22 Batch and onwards			
Assessment	:	**Theory**		**Practical**	
		20% Sessional Work,			
		30% Mid Semester Examination		-------------	
		50% Final Written Examination			
Credit Hours	:	**Theory**	02	**Practical**	00
Marks	:	**Theory**	50	**Practical**	00

After Completing the "Pakistan Studies" Course, each student will be able to:

CLO No.	CLO	Domain	Taxonomy Level	PLO
	THEORY			
1.	Trace theMuslim Nationalism in South Asia and the creation of Pakistan	Cognitive	2	6
2.	Explore the Constitutional, Political and Diplomatic History of Pakistan	Cognitive	2	12
3.	Analyze the Geo-strategic importance of Pakistan and contemporary challenges to Pakistan	Cognitive	3	7

Contents:
The Historical Background of Pakistan
- Evolution and growth of Muslim society in Subcontinent
- Muslim Revivalist and Reformist Movements
- The Factors that shaped the Muslim Nationalism in the Subcontinent
- The Factors that led birth to Pakistan
- Ideology of Pakistan with special reference to Allama Muhammad Iqbal and Quaid-e-Azam Muhammad Ali Jinnah
- Role of Sindh in Making of Pakistan

History of Internal and External Affairs of Pakistan:
- The Constitutional and Political Developments in Pakistan (1947-1973)
- The Constitution of 1973; Salient Features and Amendments
- Political Development in Pakistan (1973 to date)
- Determinants of Foreign Policy of Pakistan
- Pakistan's Relations with Big Powers

Contemporary Pakistan (Issues and Challenges):
- Geo-Strategic Significance of Pakistan
- Economic Potential and its Utilization
- Challenges to National Security of Pakistan
- Internal Political, Economic and Legal Problems
- Futuristic Outlook of Pakistan

Recommended books:

A. Textbooks
1. Talbot, Ian, (2014), *Pakistan: A New History*, latest edition.
2. Wolpert, Stanley, (1997), *Jinnah of Pakistan*, latest edition.

B. Reference Books
1. Abdul Sattar, (2017), *Pakistan's Foreign Policy 1947–2016 A Concise History*, latest edition.

2. Cohen Stephen, (2011), *The Future of Pakistan*, latest edition.

3. Hussian, Zahid, (2007), *Front line Pakistan: The Struggle with Militant Islam*, latest edition.
4. Jalal, Ayesha, (2014), *The Struggle for Pakistan: A Muslim Homeland and Global Politics*, latest edition..
5. Kazimi, M. R., (2008), *A Concise History of Pakistan*, latest edition..

6. Khan, Hamid, (2017), *Constitutional and Political History of Pakistan,* latest edition.
7. Long, Roger D., (2015), *A History of Pakistan*, latest edition.

8. Rais, RasulBakhsh, (2017), *Islam, Ethnicity, and Power Politics: Constructing Pakistan's National Identity*, latest edition.
9. Riedel, Bruce, (2011), *Deadly Embrace: Pakistan, America, and the Future of Global Jihad*, latest edition.
10. Sayeed, K. B., (1960), *Pakistan: The Formative Phase*, latest edition.

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	SR.#	Approval Authority	Resolution No.	Dated
Approval:	01	Board of studies	01	26/03/2018
	02	Board of Faculty	3.1	11/04/2018
	03	Academic Council	17(ii)	23/04/2018

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF MECHATRONIC ENGINEERING

Title of Subject	:	**LINEAR ALGEBRA AND ANALYTICAL GEOMETRY**	
Course Code	:	**MTH 112**	
Semester	:	**SECOND**	**Year** : **FIRST**
Discipline	:	MECHATRONIC ENGINEERING	**Discipline Code** MTE
Effective	:	22 Batch and onwards	
	:	**Theory**	**Practical**
Assessment		20% Sessional Work, 30% Mid Semester Examination 50% Final Written Examination	-------------
Credit Hours	:	**Theory** 03	**Practical** 00
Marks	:	**Theory** 100	**Practical** 00

After Completing the "Linear Algebra And Analytical Geometry" Course, each student will be able to:

CLO No.	CLO	Domain	Taxonomy Level	PLO
	THEORY			
1.	Perform the basic operation of matrix algebra and solution of system of linear equations.	Cognitive	2	2
2.	Develop the concepts of two and three dimensional geometry.	Cognitive	2	2
3.	Analyze area and volume of bounded regions by using multiple integrals.	Cognitive	3	3

Contents:

Introductions to matrices and elementary row operations. Briefintroduction of matrices.Types of matrices.Introduction to elementary row operations. Echelon and reduced echelon forms. Rank of a matrix. Inverse of a matrix using elementary row operations.
System of linear equations. System of non-homogeneous and homogeneous linear equations.Gaussian elimination method, Gauss Jordan method.Consistence criterion for solution of homogeneous and non-homogeneous system of linear equations.Application of system of linear equations.
Determinants. Introduction to determinants. Properties of   determinants of order n. Rank of a matrix by using determinants.
Analytic geometry of 3-dimensions. Introduction; Coordinates in R3.
Line: Coordination of a point dividing a line segment in a given ratio. Straight line, in R^3. Vector form of a straight line, parametric equations of a straight line, equation of a straight line in symmetric form, direction ratios and direction cosines, angle between two straight lines; distance of a point from a line.
Plane: Equation of a plane, angle between two planes, intersection of two planes, a plane and a straight line; skew lines. Cylindrical and spherical coordinates.
Sphere: General equation of sphere. Latitude and longitude directions; direction of Qibla.
Multiple Integrals. Evaluation of double and triple integrals in Cartesian and polar coordinates..

    A. Textbooks
      1. D.D. Benice, Brief Calculus and its Applications, latest edition.
      2. R.A. Barnett, Applied Calculus, latest edition.

    B. Reference Books
      1. S.M. Yusuf, Calculus and Analytical Geometry, latest edition.
      2. S.M. Yusuf, Mathematical Methods, latest edition.

Approval:	SR.#	Approval Authority	Resolution No.	Dated
	01	Board of studies	01	26/03/2018
	02	Board of Faculty	3.1	11/04/2018
	03	Academic Council	17(ii)	23/04/2018

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF MECHATRONIC ENGINEERING

Title of Subject	:	**LINEAR CIRCUIT ANALYSIS**			
Course Code	:	**EL125**			
Semester	:	**SECOND**		**Year** :	**FIRST**
Discipline	:	MECHATRONIC ENGINEERING		**Discipline Code**	MTE
Effective	:	22 Batch and onwards			

Assessment :

Theory	Practical
20% Sessional Work,	50% Sessional Work,
30% Mid Semester Examination	------------,
50% Final Written Examination	50% Final Lab. Examination

Credit Hours	:	**Theory**	02	**Practical**	01
Marks	:	**Theory**	50	**Practical**	50

After Completing the "Linear Circuit Analysis" Course, each student will be able to:

CLO No.	CLO	Domain	Taxonomy Level	PLO
	Theory			
1.	Outline knowledge related to basic concepts, network laws and theorems of linear, RLC circuits.	Cognitive	2	1
2.	Analyze the linear circuits using the network laws and theorems.	Cognitive	4	2
	Practical			
1.	Construct basic electronic circuits using discrete components such as resistors, diodes and transistors.	Psychomotor	3	3
2.	Behave responsibility regarding the safety of oneself and others.	Affective	3	9

Contents:

CIRCUIT THEOREMS
Nodal analysis, loop analysis. Linearity property, Superposition theorem, Thevenin's theorem, Norton's theorem, Concept of power, Maximum power transfer theorems, Reciprocity theorem.

SINUSOIDS AND PHASORS
Introduction to phasors, The complex number system, Rectangular and polar forms.

R-L-C CIRCUITS
Impedance and phase angle of series RC and RL circuits, Impedance and phase angle of parallel RC and RL circuits, Series and parallel RC circuits, Power in RC and RL circuits, Series and parallel resonance.

Recommended books:

A. Textbooks
   1. Boylested, "Introductory to circuit analysis" Latest Edition.
   2. C Alexander and M Sadiku, "Fundamentals of Electric Circuits", Latest Edition.

B. Reference Books
   1. Sergio Franco, Fundamentals of Electric Circuits, Latest Edition
   2. Hayt, Kimmerly and Durbin, McGraw Hilll, Engineering Circuit Analysis, Latest Edition.

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Approval:	SR.#	Approval Authority	Resolution No.	Dated
	01	Board of studies	5.02	11/05/2022
	02	Board of Faculty	41.8	02/06/2022
	03	Academic Council	104.7 (i)	29/07/2022

EHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF MECHATRONIC ENGINEERING

Title of Subject	:	**INTRODUCTION TO COMPUTING AND PROGRAMING**		
Course Code	:	**CS110**		
Semester	:	**SECOND**	**Year** :	**FIRST**
Discipline	:	MECHATRONIC ENGINEERING	**Discipline Code**	MTE
Effective	:	22 Batch and onwards		

		Theory	**Practical**
Assessment	:	20% Sessional Work, 30% Mid Semester Examination 50% Final Written Examination	50% Sessional Work, -------------, 50% Final Lab. Examination
Credit Hours	:	**Theory** 02	**Practical** 01
Marks	:	**Theory** 50	**Practical** 50

After Completing the "Computer Programming" Course, each student will be able to:

CLO No.	CLO	Domain	Taxonomy Level	PLO
THEORY				
1	Understand basic concepts of computer and communication technology, operations, and components of a generic computer system.	Cognitive	2	1
2	Implement the basic concepts of programming including conditional statements, repetitive statements, and lists.	Cognitive	3	3
PRACTICAL				
1.	Perform basic computer maintenance, troubleshooting, and upgradation.	Psychomotor	2	3
2.	Practice Microsoft Office applications for document processing.	Psychomotor	3	3
3.	Implement various programming concepts.	Psychomotor	3	5

Contents:

Introducing Computer Systems:
- Basic Definitions,
- Computer and Communicatio-n Technology
- The applications of ICT – particularly for Engineers
- Basic Operations and Components of a Generic Computer System
- Basic Operations: Input, Processing
- Output, Storage Basic components
- Hardware, Software, Data, Users
- Types of Storage Devices

Processing Data:
- Transforming data into information
- How computers represent and process data
- Processing Devices
- CPU Architectures

The Internet:
- The internet and the World Wide Web – browsers, HTML
- URLs/How DNS works
- Networking Basics
- Uses of Networks
- Common Types of Networks (LAN, MAN, WAN etc)
- Introduction to OSI Model
- Future of Networks

Computer Programming:
- Introduction to Problem Solving,
- Introduction to Programming,
- Role of Compiler and Linker,
- Introduction to Algorithms
- Basic Data Types and Variables, Input/Output constructs, Arithmetic Expressions, Comparison and Logical Operators.
- Conditional Statements and execution flow for conditional statements
- Repetitive statements and execution flow of repetitive statements
- Lists and their memory organization, multi-dimensional lists.

Recommended books:

A. Textbooks
1. Computing Essentials, Timothy J. O'Leary and Linda I. O'Leary, latest Edition,
2. Discovering Computers: Fundamentals, Shelly Cashman Series, latest edition
3. Problem Solving and Programming Concepts, Maureen Sprankle and Jim Hubbard, latest edition

B. Reference Books
1. C++ Programming: From Problem Analysis to Program Design, D.S. Malik, latest edition
2. Java: An Introduction to Problem Solving and Programming, Walter Savitch, Addison-Wesley, latest edition
3. Practice of Computing Using Python, William Punch & Richard Enbody, latest edition

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Approval:	SR.#	Approval Authority	Resolution No.	Dated
	01	Board of studies (CS)	2.2	26-11-2021
	02	Board of Faculty		15-02-2022
	03	Academic Council	13	13-04-2022

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF MECHATRONIC ENGINEERING

Title of Subject	:	**MECHANICS OF MATERIALS**			
Course Code	:	**ME207**			
Semester	:	**THIRD**	**Year** :	**SECOND**	
Discipline	:	MECHATRONIC ENGINEERING	**Discipline Code**	MTE	
Effective	:	22 Batch and onwards			

Assessment	:	**Theory**	**Practical**
		20% Sessional Work,	50% Sessional Work,
		30% Mid Semester Examination	-------------,
		50% Final Written Examination	50% Final Lab. Examination
Credit Hours	:	**Theory** 02	**Practical** 01
Marks	:	**Theory** 50	**Practical** 50

After Completing the "Mechanics of Materials" Course, each student will be able to:

CLO No.	CLO	Domain	Taxonomy Level	PLO
	THEORY			
1.	Comprehend key concepts, such as stresses and strains and constitutive relationships.	Cognitive	2	1
2.	Analyze statically determinate and indeterminate structures for safety based on strength or deflection consideration.	Cognitive	4	2
	PRACTICAL			
1.	Display the behavior of metal subjected to normal and shear stresses by means of experiments.	Psychomotor	4	4
2.	Follow instructions provided for conduct of experiments.	Affective	2	9

Contents:

Stress and Strain:
Basic concept of Stress and Strain, Axial loading, Factor of safety, Poisson's ratio, stress concentration, Strain energy, thermal stresses
Torsion:
 Torsion of solid and hollow circular shafts
Bending:
Pure Bending, Simple bending theory of beams.
Analysis and Design of beams for bending:
Shear force and Bending-Moment Diagrams, **Beams under Transverse Loading**.
Transformation of Stress and Strain:
Transformation of plane stress & plane strain, Bi-axial stress, Mohr's circle, Moment of Inertia of an area, Deflection of Beam and Column.

Recommended books:

A. Textbooks
1. Ferdinand P. Beer, E. Russel Johnston Jr., John T. Dewolf, "Mechanics of Materials", McGraw Hill, latest edition.
2. Ansel C. Ugural, "Mechanics of Materials", Wiley, latest edition.
3. Clarence W. de Silva "Mechanics of Materials", Latest Edition.

B. Reference Books
1. R.C Hibbeler, "Mechanics of Materials" Prentice Hall, latest edition.
2. J.M. Gere and S.P.Timoshenko, "Mechanics of Materials", Cengage Learning, latest edition.

Approval:	SR.#	Approval Authority	Resolution No.	Dated
	01	Board of studies	5.02	11/05/2022
	02	Board of Faculty	41.8	02/06/2022
	03	Academic Council	104.7 (i)	29/07/2022

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF MECHATRONIC ENGINEERING

Title of Subject	:	**ENGINEERING DYNAMICS**			
Course Code	:	**ME216**			
Semester	:	**THIRD**	Year	:	**SECOND**
Discipline	:	MECHATRONIC ENGINEERING	**Discipline Code**		MTE
Effective	:	22 Batch and onwards			
Assessment	:	**Theory**		**Practical**	
		20% Sessional Work,			
		30% Mid Semester Examination	-------------		
		50% Final Written Examination			
Credit Hours	:	**Theory** 03		**Practical** 00	
Marks	:	**Theory** 100		**Practical** 00	

After Completing the "Engineering Dynamics" Course, each student will be able to:

CLO No.	CLO	Domain	Taxonomy Level	PLO
	THEORY			
1.	Explain Newton's laws to particles and rigid bodies in motion	Cognitive	2	1
2.	Apply the principle of work, energy, linear and angular momentum to solve problems related to kinetics of particles or rigid body.	Cognitive	3	2

Contents:

Kinematics of Particle: Introduction, rectilinear motion, velocity and acceleration, equations of motion and the graphs of motion for constant and variable acceleration, relative motion, curvilinear motion, projectile motion, tangential and normal components of acceleration, cylindrical components.

Kinetics of Particle: Newton's laws of motion. D'Alembert's principle, equations of motion for rectangular, normal, tangential & cylindrical coordinates. Work, power, energy, work of force, work-energy equation, law of conservation of energy, efficiency of machine, impulse and momentum, impulse and impulsive force, linear momentum and its conservation, impact & coefficient of restitution, angular momentum and its conservation.

Kinematics of Rigid body: Rigid body motion about fixed axes, relative motion analysis.

Kinetics of Rigid body: Planar kinetic equation of motion with regard to translation & rotation about fixed axes, general planar motion, kinetic energy of rotation, work of force & couple, principle of work & energy, conservation of energy, principle of impulse & momentum, conservation of momentum.

Recommended books:

A. Textbooks
1. R.C. Hibbeler, "Engineering Mechanics (Dynamics)", Pearson Education, latest edition.

B. Reference Books
1. Beer & Johnston, "Vector Mechanics for Engineers (Dynamics)", Mc-Graw Hill Education, latest edition.
2. J.L Meriam, "Engineering Mechanics (Dynamics)", Wiley, latest edition.

Approval:

SR.#	Approval Authority	Resolution No.	Dated
01	Board of studies	5.02	11/05/2022
02	Board of Faculty	41.8	02/06/2022
03	Academic Council	104.7 (i)	29/07/2022

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF MECHATRONIC ENGINEERING

Title of Subject	:	**DATA STRUCTURES AND OBJECT ORIENTED PROGRAMMING**		
Course Code	:	**CS 291**		
Semester	:	**THIRD**	Year :	**SECOND**
Discipline	:	MECHATRONIC ENGINEERING	**Discipline Code**	MTE
Effective	:	22 Batch and onwards		
Assessment	:	**Theory**	**Practical**	
		20% Sessional Work,	50% Sessional Work,	
		30% Mid Semester Examination	-------------,	
		50% Final Written Examination	50% Final Lab. Examination	
Credit Hours	:	**Theory** 02	**Practical** 01	
Marks	:	**Theory** 50	**Practical** 50	

After Completing the "Data Structures And Object Oriented Programming" Course, each student will be able to:

CLO No.	CLO	Domain	Taxonomy Level	PLO
	THEORY			
1.	Describe and identify fundamental concepts of object-oriented programming, and basic and advanced data structures	Cognitive	2	1
2.	Apply algorithms and principles of object-oriented programming and advanced data structures to a particular situation	Cognitive	3	2
3.	Design, and debug small-to-moderate programs to manipulate and manage data elements while exhibiting the object-oriented programming skills.	Cognitive	5	3
	PRACTICAL			
1.	**Reproduce** and debug simple computer programs.	Psychomotor	3	3
2.	Follow instructions provided for conduct of experiments.	Affective	2	9

Contents:

Introduction to data structures: Elementary data organization, data structure selection & algorithm development, data structure operations, space-time analyses.

Basic data structure types: Records, and applications of records, structures and nested structures, arrays of structures

Advanced data structures: Lists and simple linked lists, different implementations of lists, trees and binary trees, stacks, queues, graphs and heaps.

Basic Algorithm types: Traversing, searching, hashing and sorting algorithms, arithmetic expression.

Introduction to Object oriented approach: Introduction to object oriented programming, need and basic characteristics of object-oriented languages. C and C++.

C++ Programming basics: Output using cout directives, Input with cin, data types and type conversion

Functions: Returning values from functions, reference arguments, overloaded function, Inline function, Default arguments, returning by reference.

Object and Classes: Core object concepts (Encapsulation, Abstraction, Polymorphism, Classes) Implementation of classes in C++, C++ Objects as physical object, C++ object as data types constructor. Object as function arguments. The default copy constructor, returning object from function, structures and classes.

Arrays and string arrays fundamentals: Arrays as class member data, arrays of object, string, the standard C++ String class

Operator overloading: Overloading unary operations, overloading binary operators, data conversion, pitfalls of operators overloading and conversion keywords.

Inheritance: Concept of inheritance, derived class and base classes, derived class constructors, member function, class hierarchies, inheritance and graphics shapes, public and private inheritance.

Pointer: Addresses and pointers. The address of operator and pointer and arrays, C-types string. Memory management: New and Delete, pointers to objects.
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Recommended books:

A. Textbooks
1. A. M. Tenenbaum ;Data structures using C, latest edition.
2. Yedidyah Langsam; Data Structures Using C and C++, latest edition.

B. Reference Books
1. Lafore, Robert; Object-Oriented Programming in C++, latest edition.
2. Harvey & Paul Deitel; C++ How to Program, latest edition.

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Approval:

SR.#	Approval Authority	Resolution No.	Dated
01	Board of studies	1.01	23/06/2015
02	Board of Faculty	31.04	12/11/2015
03	Academic Council	86.7	17/12/2015

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF MECHATRONIC ENGINEERING

Title of Subject	:	**ELECTRONIC DEVICES AND CIRCUITS**		
Course Code	:	**ES247**		
Semester	:	**THIRD**	Year :	**SECOND**
Discipline	:	MECHATRONIC ENGINEERING	**Discipline Code**	MTE
Effective	:	22 Batch and onwards		
Assessment	:	**Theory**	**Practical**	
		20% Sessional Work,	50% Sessional Work,	
		30% Mid Semester Examination	------------,	
		50% Final Written Examination	50% Final Lab. Examination	
Credit Hours	:	**Theory** 03	**Practical** 01	
Marks	:	**Theory** 100	**Practical** 50	

After Completing the "Electronic Devices And Circuits" Course, each student will be able to:

CLO No.	CLO	Domain	Taxonomy Level	PLO
	THEORY			
1.	Explain basic Physics of semiconductor material and structure and operation of the pn junction.	Cognitive	2	1
2.	Discuss device operations and diodes, BJT, MOSFET and thyristors.	Cognitive	2	2
3.	Analyze dc and ac response of small signal amplifier circuits using device models	Cognitive	4	4
	PRACTICAL			
1.	Reproduce basic electronic circuits on board using discrete components i.e. resistors, diodes and transistors, and develop project using discrete components and/or circuit simulation platform.	Psychomotor	3	5
2.	Behave responsibly regarding the safety of oneself and others.	Affective	3	9

Contents:

Semiconductor Diodes: Basic concepts of semiconductors, Impurities in Semiconductors, Electron & hole concentrations in Doped Semiconductors. PN junction physics, Diodes, Terminal characteristics of junction diodes, Diode characteristics under reverse, zero & forward bias, PN Junction Capacitance,
Analysis of diode circuits, Special purpose diodes, Rectifier circuits, Limiting & Clamping circuits, Circuit applications of diodes.

Bipolar Junction Transistor: Physical Structure and operating principles of BJTs, Operating regions of bipolar transistor, Basic BJT circuit configurations, DC analysis, Small signal and Large signal models of BJT, BJT as a switch.

MOS Field-Effect Transistors: Physical Structure and operating principles of FETs, MOSFETs, Enhancement and Depletion type MOSFETs, basic MOSFET circuit configurations, DC analysis, Small signal and Large signal models of MOSFETs.

Insulated gate bipolar transistors (IGBT): Physical Structure and operating principles.

Thyristor: Thyristor, Operating modes of SCR, Triggering and Commutation methods of SCR, Switching Application of SCR. DIAC, TRIAC and their applications.

Recommended books:

A. Textbooks
1. Theodore F. *Bogart*, Jeffrey S. Beasley, Guillermo Rico, "Electronic Devices and Circuits", Latest edition.
2. Robert Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Prentice Hall, Latest Edition.
3. Muhammad H. Rashid, "Power Electronics: Circuits, Devices and Applications," Prentice Hall, Latest Edition.

B. Reference Books
1. Robert Paynter, " Introductory Electronic Devices and Circuits: Electron Flow Version", Latest Edition
2. Thomas L. Floyd, "Electronic Devices and Circuits*",* Latest edition.

Approval:

SR.#	Approval Authority	Resolution No.	Dated
01	Board of studies	5.02	11/05/2022
02	Board of Faculty	41.8	02/06/2022
03	Academic Council	104.7 (i)	29/07/2022

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF MECHATRONIC ENGINEERING

Title of Subject	:	**ORDINARY AND PARTIAL DIFFERENT EQUATIONS**
Course Code	:	**MTH 227**
Semester	:	**THIRD** **Year** : **SECOND**
Discipline	:	MECHATRONIC ENGINEERING **Discipline Code** MTE
Effective	:	22 Batch and onwards

Assessment	:	**Theory**	**Practical**
		20% Sessional Work,	
		30% Mid Semester Examination	-----------
		50% Final Written Examination	

Credit Hours	:	**Theory**	03	**Practical**	00
Marks	:	**Theory**	100	**Practical**	00

After Completing the "Ordinary And Partial Different Equations" Course, each student will be able to:

CLO No.	CLO	Domain	Taxonomy Level	PLO
	THEORY			
1.	Assess the formation and the solution methods of first order linear and non-linear differential equation	Cognitive	2	2
2.	Evaluate higher order differential equations and their types	Cognitive	2	2
3.	Analyze the Partial differential equations and their solutions	Cognitive	3	3

Contents:

First Order Linear and Non-Linear Differential Equations: Introduction, formation and solution of first order, first degree Differential Equations.

Higher Order Linear Differential Equations: Homogeneous linear equations of order n with constants coefficients, solutions of higher order differential equations according to the roots of auxiliary equation. Non-Homogeneous linear equations. Cauchy Euler equation. Method of variations of parameters. Applications of higher order linear differential equations.

Introduction to Partial Differential Equations: Formation of Partial differential equations. Solution of PDE by direct integration and variable separable method. Linear and non – linear PDE's of first order. Classification of PDE's. Solution of Laplace's equation, Heat equation and Wave equation.

Recommended books:

> **Recommended books:**

A. **Textbooks**
   1. D. Murray, Differential Equations, latest edition.
   2. H.K.Dass, Advance Engineering Mathematics, latest edition.

B. **Reference Books**
   1. B. S. Grewal, Higher Engineering Mathematics, latest edition.
   2. S.M Yusuf, Mathematical Methods, latest edition.
   3. J.L.V Iwaarden, Ordinary Differential Equation with Numerical Techniques, latest edition.
   4. Erwin Kreyzig, Advance Engineering Mathematics, latest edition.

Approval:	SR.#	**Approval Authority**	**Resolution No.**	**Dated**
	01	Board of studies	01	26/03/2018
	02	Board of Faculty	3.1	11/04/2018
	03	Academic Council	17(ii)	23/04/2018

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF MECHATRONIC ENGINEERING

Title of Subject	:	**COMMUNICATION SKILLS**			
Course Code	:	**ENG201**			
Semester	:	**THIRD**	Year :	**SECOND**	
Discipline	:	MECHATRONIC ENGINEERING	**Discipline Code**	MTE	
Effective	:	22 Batch and onwards			
	:	**Theory**	**Practical**		
Assessment		20% Sessional Work, 30% Mid Semester Examination 50% Final Written Examination	-------------		
Credit Hours	:	**Theory** 02	**Practical**	00	
Marks	:	**Theory** 50	**Practical**	00	

After Completing the "Communication Skills" Course, each student will be able to:

CLO No.	CLO	Domain	Taxonomy Level	PLO
	THEORY			
1.	write various formal and in-formal writing genres.	Cognitive	6	10
2.	use integrated skills to communicate effectively in professional settings and beyond.	Cognitive	3	9

Contents:

Introduction to communication: Explanation, concept, kinds, process and ce of communications. Effective communication, SEF model and characteristics of communications, barriers to communications.

Principles of Communication: Introduction to seven C's, role of seven C's, use of seven C's in daily and business communication.

Writing Skills: Introduction to effective writing, purpose of writing, stages of writing, reader's analysis, organization/gathering of writing material, writing techniques, approaches to written communication, writing formats (paragraphs, headings, subheadings, numbering etc).

Report Writing: Introduction and significance of report writing, internal office communication, effective business letter writing, organizing business messages, managing, and organizing long business reports, feasibility report and incident report, writing a business proposal, business requests, writing job application, resume/CV writing.

Handling Business Meetings: Agenda writing, minutes of the meeting, recording and presenting minutes of the meeting, successful written and oral presentation: presentation techniques including collecting and managing material, making and using audio visual aids, handling questions and audiences, attention getting techniques, personal management in presentation, persuasive communication.

Presentation Skills: Formal Presentation Skills (3 P'S of Presentation) Public Speaking (Do's and Don'ts, Target audience, Required message, selection of medium and topic)

Recommended books:

Textbooks

A. 1. Cosmo F. Ferrara, "Writing on the Job", latest edition

2.. Murphy, "Effective Communication", latest edition

Approval:	SR.#	Approval Authority	Resolution No.	Dated
	01	Board of studies (CELL)	1	21-11-2019
	02	Board of Faculty (FoST&H)		19-07-2021
	03	Academic Council		24-08-2021

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF MECHATRONIC ENGINEERING

Title of Subject	:	**LAPLACE TRANSFORMS AND DISCRETE MATHEMATICS**
Course Code	:	**MTH 217**
Semester	:	**FOURTH** Year : **SECOND**
Discipline	:	MECHATRONIC ENGINEERING **Discipline Code** MTE
Effective	:	22 Batch and onwards
Assessment	:	**Theory** **Practical**
		20% Sessional Work,
		30% Mid Semester Examination -------------
		50% Final Written Examination
Credit Hours	:	**Theory** 03 **Practical** 00
Marks	:	**Theory** 100 **Practical** 00

After Completing the "Laplace Transforms And Discrete Mathematics" Course, each student will be able to:

CLO No.	CLO	Domain	Taxonomy Level	PLO
	THEORY			
1.	Perform Laplace Transformation and its applications.	Cognitive	2	2
2.	Analyze Fourier transforms for the solution of differential equations	Cognitive	3	3
3.	Assess discrete mathematics and graph theory	Cognitive	2	2

Contents:

Laplace Transforms: Laplace and inverse Laplace transform of elementary functions and Their properties. Applications of Laplace transformation in various fields of engineering.

Fourier Transform: Fourier transforms and inverse Fourier transforms. Solution of differential equations using Fourier Transform.

Discrete Mathematics: Introduction; Sets; Relations; Functions; Logics; Mathematical Induction; Permutation and Combination; Recurrence Relations and their solution;

Graph Theory. Representation of Graphs; Paths and Circuits; Shortest Path Algorithm; Isomorphism of Graphs; Planar Graphs; Trees and their properties; Spanning Trees; Minimal spanning.

Recommended books:
   A. Textbooks
       1. M.R. Speigel, Schaum's outline series, Theory and problems of laplace Transforms, McGraw-Hill, latest edition.
       2. M.R. Speigel, Schaum's outline series, Theory and problems of complex variables McGraw-Hill, latest edition.
   B. Reference Books
       1. H.K. Dass, Engineering Mathematics, latest edition.
       2. B.S.Grewall, Higher Engineering Mathematics, latest edition.
       3. Erwin Kreyszig, Advance Engineering Mathematics, latest edition.

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Approval:	SR.#	Approval Authority	Resolution No.	Dated
	01	Board of studies	01	26/03/2018
	02	Board of Faculty	3.1	11/04/2018
	03	Academic Council	17(ii)	23/04/2018

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF MECHATRONIC ENGINEERING

Title of Subject	:	**FLUID MECHANICS**		
Course Code	:	**MTE236**		
Semester	:	**FOURTH**	Year :	**FIRST**
Discipline	:	MECHATRONIC ENGINEERING	**Discipline Code**	MTE
Effective	:	22 Batch and onwards		

Assessment	:	**Theory**	**Practical**
		20% Sessional Work,	50% Sessional Work,
		30% Mid Semester Examination	------------,
		50% Final Written Examination	50% Final Lab. Examination

Credit Hours	:	**Theory**	02	**Practical**	01
Marks	:	**Theory**	50	**Practical**	50

After Completing the "Fluid Mechanics" Course, each student will be able to:

Sr. No.	CLO	Domain	Taxonomy Level	PLO
	THEORY			
1.	Explain the fundamental concepts of fluid mechanics.	Cognitive	2	1
2.	Analyze the statics and dynamics of fluids	Cognitive	4	2
	PRACTICAL			
1.	Perform the experiments involving hydrostatic thrust, variable area flow, orifice and the reaction forces.	Psychomotor	3	4
2.	Follow instructions provided for conduct of experiments.	Affective	2	9

Contents:

Introduction to Fluid Mechanics**:** What is fluid, classification of fluid, and fluid properties

Fluid Statics**:** Basic equation for pressure field, pressure measuring devices, hydrostatic forces on submerged surface, buoyancy, floatation and stability, **applications in mechatronics**.

Fluid Dynamics: Principles of fluid motion, Definition of path line, streamline, streak line and timeline. Derivation of Bernoulli's and Euler's equation. Flow measurements. Velocity and acceleration field. Derivation of Reynolds transport theorem. Rayleigh's method and Buckingham's Pi theorem. Boundary layer theory, **applications in mechatronics**.

Recommended books:

  A.   Textbooks
   1. Fundamentals of Fluid Mechanics by Bruce R. Munson, Donald F. Young and Theodore H. Oliishe, Wiley, Latest Edition.
   2. Engineering Fluid Mechanics by Donald F. Elger, Barbara C. Williams, Clayton T. Crowe and John A. Roberson, Wiley, Latest Edition
   3. Fluid Mechanics by F. M White, McGraw-Hill, Latest Edition

  B.   Reference Books
   1. Fluid Mechanics and Hydraulic Machinery, by K. R. Arora, Standard Publisher, Latest Edition.

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Approval:	Sr.#	Approval Authority	Resolution No.	Dated
	01	Board of studies	5.02	11/05/2022
	02	Board of Faculty	41.8	02/06/2022
	03	Academic Council	104.7 (i)	29/07/2022

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF MECHATRONIC ENGINEERING

Title of Subject	:	**DIGITAL LOGIC DESIGN**		
Course Code	:	**ES217**		
Semester	:	**FOURTH**	**Year** :	**SECOND**
Discipline	:	MECHATRONIC ENGINEERING	**Discipline Code**	MTE
Effective	:	22 Batch and onwards		

Assessment	:	**Theory**	**Practical**
		20% Sessional Work,	50% Sessional Work,
		30% Mid Semester Examination	-------------,
		50% Final Written Examination	50% Final Lab. Examination

Credit Hours	:	**Theory**	02	**Practical**	01
Marks	:	**Theory**	50	**Practical**	50

After Completing the "Digital Logic Design" Course, each student will be able to:

CLO No.	CLO	Domain	Taxonomy Level	PLO
	THEORY			
1.	Explain fundamental concepts of digital logic design including basic and universal gates, number systems, binary coded systems, basic components of combinational and sequential circuits	Cognitive	2	1
2.	Apply techniques related to the design and analysis of digital electronic circuits including boolean algebra and multi-variable k-map methods.	Cognitive	3	2
3.	Design Combinational and Sequential logic Circuits using basic gates as well as MSI devices.	Cognitive	5	3
	PRACTICAL			
1.	**Develop** digital systems using the standard integrated circuits and explain how various digital functions can operate together as a total system to perform a specified task.	Psychomotor	4	5
2.	Organize the lab data to emphasize experimental objectives, procedures, observations etc.	Affective	4	10

Contents:
Introductory Digital Concepts: Digital and analog quantities, digital and analog systems, logic levels and digital wave forms, representing binary quantities, digital integrated circuits, integrated circuits classifications.
Number Systems: numbering systems, conversions.
Logic Gates: Introduction to digital logic gates, implementing Boolean expressions with logic gates, describing logic circuits algebraically.
Boolean Algebra and Logic Simplification: Boolean Operations and Expressions, Simplification using Boolean algebra and theorems, Karnaugh Map minimization
Combinational Logic: Basic Combinational Logic Circuits, Implementation of combinational logic, the universal property of NAND and NOR gates, combinational logic using NAND and NOR gates, Adders, Multiplexers, DeMultiplexers, Decoders, Encoders, Comparators.
Sequential Logic : Introduction to Sequential Logic, Basic S-R latch, Flip-Flop and its types, counters, Shift Registers.

Recommended books:

A. **Textbooks**

1. Digital Logic and Computer Design by M. Morris Mano, Prentice Hall (India), latest edition.

2. Digital Fundamentals by Thomas L. Floyd, 11th Edition, Prentice Hall International, latest edition.

B. **Reference Books**

1. David J. Comer , Digital Logic & State Machine Design, Latest Edition.

2. A.W. Shaw, Logic Circuit Design, Latest Edition.

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	SR.#	Approval Authority	Resolution No.	Dated
Approval:	01	Board of studies	5.02	11/05/2022
	02	Board of Faculty	41.8	02/06/2022
	03	Academic Council	104.7 (i)	29/07/2022

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF MECHATRONIC ENGINEERING

Title of Subject	:	**MECHANICS OF MACHINES**			
Course Code	:	**ME-237**			
Semester	:	**FOURTH**	**Year**	:	**SECOND**
Discipline	:	MECHATRONIC ENGINEERING	**Discipline Code**		MTE
Effective	:	22 Batch and onwards			
Assessment	:	**Theory**		**Practical**	

		20% Sessional Work,	50% Sessional Work,	
		30% Mid Semester Examination	------------,	
		50% Final Written Examination	50% Final Lab. Examination	
Credit Hours	:	**Theory** 02	**Practical** 01	
Marks	:	**Theory** 50	**Practical** 50	

After Completing the "Mechanics Of Machines" Course, each student will be able to:

CLO No.	CLO	Domain	Taxonomy Level	PLO
	THEORY			
1.	Comprehend the concepts of mechanics for the design of machine elements/members.	Cognitive	2	1
2.	Apply kinematic analysis principles to various mechanisms.	Cognitive	3	2
3.	Analyze analytical and graphical solutions to complex engineering problems in various machines and mechanisms for position, velocity and acceleration analysis of planar mechanisms	Cognitive	4	3
	PRACTICAL			
1.	Perform operations on trainers and apparatus as directed produce results (Crank and connecting rod apparatus, Crank & slotted lever quick return mechanism, Cam trainer).	Psychomotor	3	4
2.	Follow instructions provided for conduct of experiments.	Affective	2	9

Contents:

Introduction: Kinematic link, joints, pairs, kinematic chain, mechanism and its inversion, degree of freedom of a mechanism, four bar mechanism, single slider crank chain & its inversions.

Linkages: Position analysis, velocity analysis using instantaneous center method, acceleration analysis.

Cams & Followers: Types, displacement diagram and Cam profile. Kinematics of Geneva wheel.

Gears & Gear Trains: Spur gear terminology, velocity ratios of simple and compound gear trains.

Recommended books:

A. Textbooks
1. R.S. Khurmi, J. K. Gupta, "Theory of Machines",Eurasia Publishing House, latest edition.
2. David H. Myszka, "Machines and Mechanisms",Pearson Education, latest edition.

B. Reference Books
1. B.V.R Gupta, "Theory of Machines", I.K International Publishing House Pvt Ltd, New Delhi, India, latest edition.
2. J.E. Shigley, John Joseph Uicker Jr. "Theory of Machines & Mechanisms", McGraw Hill, latest edition.

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Approval:	SR.#	Approval Authority	Resolution No.	Dated
	01	Board of studies	5.02	11/05/2022
	02	Board of Faculty	41.8	02/06/2022
	03	Academic Council	104.7 (i)	29/07/2022

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF MECHATRONIC ENGINEERING

Title of Subject	:	**INSTRUMENTATION AND MEASUREMENTS**		
Course Code	:	**MTE212**		
Semester	:	**FOURTH**	**Year** :	**SECOND**
Discipline	:	MECHATRONIC ENGINEERING	**Discipline Code**	MTE
Effective	:	22 Batch and onwards		

		Theory	**Practical**
Assessment	:	20% Sessional Work, 30% Mid Semester Examination 50% Final Written Examination	50% Sessional Work, ------------, 50% Final Lab. Examination
Credit Hours	:	**Theory** 03	**Practical** 01
Marks	:	**Theory** 100	**Practical** 50

After Completing the "Instrumentation And Measurements" Course, each student will be able to:

CLO No.	CLO	Domain	Taxonomy Level	PLO
	THEORY			
1.	Explain fundamental principles of measurement	Cognitive	2	1
2.	Apply physical principles to sensors	Cognitive	3	1
3.	Develop a data acquisition system	Cognitive	5	3, 5
	PRACTICAL			
1.	Construct a complete instrumentation and measurement system data acquisition, display, archiving and retrieval.	Psychomotor	3	5
2.	Perform with the safety instructions, rules and regulations.	Affective	2	8
3.	Explain the integration of transducers with analog and digital hardware and use of software to achieve required output for measurement system.	Cognitive	2	3

Contents:

Introduction: Measurement system applications; Elements of a measurement system; Choosing appropriate measuring instruments.

Instrument types and performance characteristics: Instrument types: Active and passive instruments; Null-type and deflection-type instruments; Analogue and digital instruments; Indicating instruments and instruments with a signal output; Smart and non-smart instruments.

Static characteristics of instruments: Accuracy and inaccuracy (measurement uncertainty); Precision; Tolerance; Range or span; Linearity; Sensitivity of measurement; Threshold; Resolution; Hysteresis effects; Dead space.

Dynamic characteristics of instruments: Zero order instrument; First order instrument; Second order instrument.

Errors and noise: Systematic error, random error; sources of systematic and random errors, techniques for the reduction of systematic and random errors, Sources of measurement noise; Techniques for reducing measurement noise.

Calibration: Principles of calibration; Control of calibration environment; Calibration chain and traceability; Calibration records.

Sensor for measurement:

Sensors for measurement of temperature: Thermocouples, RTDs, Thermisters, Semiconductor devices, Radiation thermometers.

Sensors for measurement of displacement and position: digital encoders, shaft encoders, absolute and relative encoders, linear encoders.

Sensors for measurement of force, pressure, strain, vibration, velocity, flow rate.

Signal conditioning and data acquisition design: Types of bridge circuits for measurement of resistance, inductance, and capacitance. Analog to digital conversion. Systems for signal processing and signal transmission. Data recording and data acquisition systems. Microprocessor based instrumentation circuits.

Recommended books:

A. Textbooks
1. J.B Gupta, "Course in Electronics and Electrical Measurements and Instrumentation", S.K. Kataria, latest edition
2. Haslam & Summers & Williams, "Engineering Instrumentation and Control", Edward Arnold, latest edition

B. Reference Books
1. W. Bolton, "Control Engineering ",Butterworth, latest edition
2. Thomas G. Beckwith, Roy D. Marangoni, John H. Lienhard, "Mechanical Measurements", Pearson, latest edition
3. James W. Dally, William F. Riley, Kenneth G. McConnell, "Instrumentation for Engineering Measurements", Wiley, latest edition.

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Approval:

SR.#	Approval Authority	Resolution No.	Dated
01	Board of studies	5.02	11/05/2022
02	Board of Faculty	41.8	02/06/2022
03	Academic Council	104.7 (i)	29/07/2022