B.Tech. Semester-I (Mechanical Engineering-Major)

S N	Course Category	Course Code	Name of Course	BoS	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
									Theory				Practical		
					(Th)	TU	P		Exam Hrs.	SEE	CIE	Min.	SEE	CIE	Min.
1	BSC - I	BME1T01	Mathematics – I (Applied Mathematics)	ASH	3	-	-	3	3	70	30	45	-	-	-
2	BSC – II	BME1T02	Applied Physics	ASH	2	-	-	2	3	70	30	45	-	-	-
3	BSC – II	BME1P02	Applied Physics	ASH	-	-	2	1	-	-	-		25	25	25
4	ESC – I	BME1T03	Engineering Graphics	Mechanical	3	-	-	3	3	70	30	45	-	-	-
5	ESC – I	BME1P03	Engineering Graphics Lab	Mechanical	-	-	2	1	-	-	-	-	-	50	25
6	ESC – II	BME1T04	C-Programming	Mechanical	3	-	-	3	3	70	30	45	-	-	-
7	ESC – II	BME1P04	C-Programming	Mechanical	-	-	2	1	-	-	-	-	25	25	25
8	AEC-I	BAE1T01	Communication Skill	ASH	1	-	-	1	2	35	15	23			
9	AEC-I	BAE1P01	Communication Skill	ASH	-	-	2	1	-	-	-	-	25	25	25
10	VSC - I	BVS1P01	Workshop Practices	Mechanical	-	-	4	2	-	-	-	-	50	50	50
11	CC – I	BCC1P01	Refer CC Basket	ASH	-	-	4	2	-	-	-	-	-	100	50
			Total		**12**	**-**	**16**	**20**		**315**	**135**		**125**	**275**	

B. Tech. Sem-II (Mechanical Engineering-Major)

S N	Course Category	Course Code	Name of Course	BoS	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
									Theory				Practical		
					(Th)	TU	P		Exam Hrs.	SEE	CIE	Min.	SEE	CIE	Min.
1	BSC–III	BME2T05	Mathematics – II (Applied Mathematics)	ASH	3	-	-	3	3	70	30	45	-	-	-
2	BSC–III	BME2P05	Mathematics – II (Applied Mathematics)	ASH		-	2	1	-	-	-	-	25	25	25
3	BSC–IV	BME2T06	Applied Chemistry	ASH	3	-	-	3	3	70	30	45	-	-	-
4	BSC–IV	BME2P06	Applied Chemistry	ASH			2	1	-	-	-	-	-	50	25
5	ESC– III	BME2T07	Engineering Mechanics	Mechanical	3	-	-	3	3	70	30	45	-	-	-
6	ESC– III	BME2P07	Engineering Mechanics Lab	Mechanical			2	1	-	-	-	-	25	25	25
7	PCC – I	BME2T08	Basics of Mechanical Engineering	Mechanical	2	-	-	2	3	70	30	45	-	-	-
8	IKS–I	BIK2T01	Refer IKS Basket	ASH	2	-	-	2	3	70	30	45	-	-	-
9	SEC - I	BSE2P01	Refer SEC Basket		-	-	4	2	-	-	-	-	50	50	50
10	CC– II	BCC2P02	Refer CC Basket	ASH	-	-	4	2	-	-	-	-	-	100	50
			Total		**13**	**-**	**14**	**20**		**350**	**150**		**100**	**250**	

Exit option: Award of UG Certificate in Major with 40 credits and an additional 8credits in skill-based courses, internship, mini projects etc.

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FACULTY OF SCIENCE & TECHNOLOGY
B.TECH. MECHANICAL ENGINEERING

Sem: I	Total Hours Distribution per week	
Total Credit : 3	Lecture (L): 3 Hrs	Tutorial/Activity (T/A): 0 Hr.
Subject Code	BME1T01	Mathematics (Applied Mathematics – I)
Examination Scheme		
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks	70 Marks	45 Marks	3 Hours

	Course Objectives
1	The topics covered will equip them the techniques to understand advanced level mathematics and its applications that would enhance analytical thinking power.
2	The aim is to inculcate and develop the basic mathematics skills of engineering students that are imperative for effective understanding of engineering subjects.

	Course Outcomes
After completion of syllabus, students would be able to	
1	Apply elementary transformations to determine its rank and interpret the various solutions of system of linear equations. Identify the special properties of a matrix such as the eigen value, eigen vector, to express the matrix into diagonal form.
2	Apply the concept of successive differentiation to express the function in series form and evaluation of indeterminate forms.
3	To understand the significance of derivatives of functions of several variables and use it to find series approximation to the functions of two variables, extreme values of the functions and functional relationship.
4	To solve ordinary differential equations using elementary techniques and apply it to formulate mathematical models for simple electrical circuits.
5	To solve higher order differential equations by using various techniques and apply it to solve the problems in engineering field.

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	**T/A**	**CO**
Unit-1 Matrices			
Rank of a matrix, Consistency of linear system of non-homogeneous and homogeneous equations, Linear dependence of vectors, Eigen values and Eigen vectors, Cayley- Hamilton theorem, Sylvester's theorem (Statement only), Inverse of matrix	7		1
Unit 2: Differential Calculus			
Successive differentiation: Leibnitz's Rule, Taylor's and Maclaurin's series for function of one variable, Indeterminate forms and L'Hospital's Rule.	5		2
Unit 3: Multivariable Calculus (Differentiation)			
Functions of several variables, First and Higher order partial derivatives, Euler's theorem, Chain rule and Total differential coefficient, Functional Relationship between two functions using Jacobians, Taylor's and Maclaurin's series for function of two variables. Maxima and Minima for function of two variables, Lagrange's method of undetermined multipliers.	10		3
Unit 4: First Order Ordinary Differential Equations			
Reducible to linear (Bernoulli's) differential equations, Exact differential equations (excluding the cases of integrating factors), Equations of first order and higher degree: Solvable for p, Solvable for y, Solvable for x and Clairaut's type, Application of first order differential equation to simple electrical circuits.	5		4
Unit-5: Higher Order Ordinary Differential Equations			
Higher order ordinary linear differential equations with constant coefficients, Method of variation of parameters, Cauchy's homogeneous differential equations, Equations of the type $d^2y/dx^2=f(y)$.	9		5

Text/Reference Books:
(1) Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
(2) Ramana B.V., Higher Engineering Mathematics, Tata Mc-Graw Hill, New Delhi, 11th Reprint, 2010.
(3) N.P. Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
(4) B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
(5) P. N. Wartikar and J. N. Wartikar, Applied Mathematics, Volume I and II.
(6) H.K Dass, Rama Verma, RajnishVerma, V.J. Dagwal, Sajid Anwar and D.F. Shastrakar, Engineering Mathematics, Volume I and II, S. Chand.

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FACULTY OF SCIENCE & TECHNOLOGY
B.TECH- MECHANICAL ENGINEERING

Sem: I	Total Hours Distribution per week		
Total Credit : 2	Lecture (L): 2Hrs	Tutorial/Activity (T/A): 0 Hr.	
Subject Code	BME1T02	Applied Physics	
Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks	70 Marks	45 Marks	3 Hours

Course Objectives	
1	To introduce ideas of quantum mechanics necessary to understand the function of semiconductor devices
2	To gain an understanding of the phenomenon of interference used for advanced applications in optics
3	To familiarize prospective engineers with fundamental concepts of semi-conductors and their applications in semiconductor technology
4	To make acquainted with the laser technology and the operations of Laser

Course Outcomes	
After completion of syllabus, students would be able to	
1	Learn the basic concepts of the dual nature of matter and wave packet and apply them to analyze various relevant phenomena and to solve related numerical problems.
2	Apply concepts in interference and diffraction to solve relevant numerical problems and to relate to relevant engineering applications
3	Identify and explain different types of diodes, transistors, and its applications.
4	Learn and explain quantum transitions and apply them to the working of lasers.

SYLLABUS

Details of Topic	Allotment of Hrs		Mapped with CO
	L	T/A	CO
Unit-1 Quantum Mechanics			
Concept of wave-particle duality, De-Broglie Hypothesis, Matter Waves, Davisson-Germer Experiment; Bohr's Quantization condition. Concept of wave packets, Heisenberg Uncertainty Principle. Schrodinger wave equation (time dependent and time independent), Wave function Ψ and normalization condition, Application to one dimensional infinite potential well.	6		1
Unit 2: Wave optics			

Huygen's principle, superposition of waves and interference of light by wavefront splitting and amplitude splitting, Interference in thin films, Interference in Wedge-shaped thin film, Newton's rings, and Anti-reflection coating.	6		2
Unit 3: Semiconductor Devices			
Semiconductor, Classification, Pure and doped semiconductors. Types of Semiconductor diodes -P-N junction Diode, Tunnel Diode, Zener Diode, Light Emitting Diode (LED), Photodiode. Transistors, Hall Effect, Hall voltage, and Hall coefficient; its applications.	6		3
Unit 4: Lasers			
Quantum Transitions: Absorption, Spontaneous emission & stimulated Emission, Metastable states, Principle of laser, Laser characteristics, Coherence length and coherence time, Pumping schemes: Three level and Four level. Optical Resonator, Construction & working of Ruby laser and He-Ne laser, Semiconductor diode laser, Applications of laser.	6		4

Text Books &Reference Books

1. P. M. Mathews and K. Venkatesan, A Textbook of Quantum Mechanics, Tata McGraw Hill (1977).
2. J. L. Powell and B. Crasemann, Quantum Mechanics, Narosa Publishing House (1993).
3. Charles Kittel, Introduction to Solid State Physics, Wiley Eastern, 5th edition, (1983).
4. A. J. Dekker, Solid State Physics, Prentice Hall of India (1971).
5. A Textbook of Engineering Physics, Dr. M. N. Avdhanulu, Dr. P. G. Kshirsagar, S. Chand Publication
6. Text book of Applied Physics, Dr. D. S. Hardas, Dr. D. S. Bhoumik, Dr.S. Shastri, Das Ganu Publication ISBN-978-93-84336-59-2 (2021)
7. Applied Physics, M. N. Avdhanulu, Shilpa A. Pande, Arti R. Golhar, Mohan Giriya, S. Chand
8. A Text Book of Engineering Physics Dr. DevashreeHardas& Dr. Ashish Panat, Das Ganu Publication ISBN-978-81-921757-7-5 (2011)
9. Applied Physics, - Dr. (Mrs)S.P. Wankhede, Dr.ShrutiPatle, Dr.(Mrs.)S.U.Bhonsule and Dr.N. S. Ugemuge DNA Publication ISBN-978-81-945174-6-7 (2020)
10. Quantum Physics of Atoms, Molecules, Solids, Nuclei, and Particles by R. Eisberg and R. Resnick, Wiley and Sons
11. Engineering Physics, second edition, Sanjay Jain, G. Sahasrabudhe, University's Press(India) Pvt. Ltd.(2016)
12. D. J. Griffiths, Quantum mechanics, Prentice Hall of India Private Limited, New Delhi
13. L. I. Schiff, Quantum Mechanics, TMH Publications
14. Advanced Engineering Materials - Dr. Sangeeta G. Itankar, Dr. ManjushaDandekar, Dr. Tushar R. Shelke, Dr. Swati Fartode, Alliance & Co. ISBN 978-93-91322-12-0 (2023)
15. Applied Physics- Dr. Sangeeta G. Itankar, Dr. ManjushaDandekar, Dr. Tushar R. Shelke, Dr. Swati Fartode, Alliance &Co. ISBN 978-93-91322-97-7 (2023)
16. David Halliday, Robert Resnick, Jearl Walker, Principles of Physics, 10th Edition, John Wiley and Sons (2017)
17. Advanced physics - Dr.ShrutiPatle, Dr.(Mrs).S.U.Bhonsule, Dr.Ashish N. Bodhaye, Dr.ManoharD.Mehare DNA Publication (2019)
18. Engineering Physics - Dr.N. S. Ugemuge, Dr.(Mrs.)S.U.Bhonsule and Dr.ShrutiPatle DNA Publication(2019)

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR

FACULTY OF SCIENCE & TECHNOLOGY
B.TECH. MECHANICAL ENGINEERING

Sem: I	Total Hours Distribution per week		
Total Credit :1	Practical (P): 2 Hrs.		
Subject Code	BME1P02	Applied Physics	
Examination Scheme - Practical			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
25 Marks	25 Marks	25 Marks	--

List of Experiments: Performance of at least eight experiments is compulsory in a semester.

Exp. No.	List of Experiments
1	Energy gap of semiconductor /thermistor.
2	Parameter extraction from V-I characteristics of PN junction diode.
3	Parameter extraction from V-I characteristics of Zener diode.
4	Parameter extraction from V-I characteristics of PNP/NPN transistor in CB and CE mode.
5	V-I Characteristics of Tunnel diode.
6	V-I Characteristics of Light Emitting Diodes/ Determination of Plank's constant by using LEDs.
7	Study of Diode rectification.
8	Study of Hall Effect and determination of Hall Voltage of a given sample.
9	Variation of Hall coefficient (R_H) with temperature.
10	To study B-H curve and to find out the values of coercivity, retentivity, and saturation magnetization of the experimental material.
11	Determination of NA for optical fiber
12	Calibration of Time Base circuit of CRO and determination of AC, DC voltage & frequency of electrical signals using CRO.
13	To determine the number of lines per cm on a diffraction grating using a LASER beam.
14	Virtual Lab: Experiment on the determination of the thickness of a thin foil using an air wedge arrangement.
15	Virtual Lab: Experiment on the determination of the refractive indices of the material corresponding to ordinary and extra - ordinary rays.

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FACULTY OF SCIENCE & TECHNOLOGY
BTECH MECHANICAL ENGINEERING

Sem: I	Total Hours Distribution per week		
Total Credit:	Lecture (L): 3 Hrs	Tutorial/Activity (T/A): 0 Hrs.	Practical (P): 0 Hrs.
Subject Code	BME1T03	Name of Subject: Engineering Graphics	
Examination Scheme			
Internal Marks:	University Marks:	Maximum Passing Marks:	Examination Duration:
30 Marks	70 Marks	45 Marks	3 Hours

Course Objective	
1	To acquire basic knowledge about Engineering Drawing Language, Line Types Dimensioning Methods and simple geometrical construction. To draw various conic sections and Engineering Curves.
2	To acquire basic knowledge about physical realization of Engineering objects and shall be able to draw its different views
3	To visualize Three Dimensional Engineering object and shall be able to draw their Isometric view.

Course Outcome	
After completion of syllabus student able to	
1	The learner will able to understand the basic knowledge of engg. Graphics such as instruments, lines, dimensioning tech., scales, sheet layout, construction of engg. Curves, basic of orthographic projection, drawing projection of point & line.
2	The learner will be able to understand projections of planes and solids and will be able to draw diff. views of projections of planes and solids.
3	The learner will be able to understand concept of orthographic views and drawing 2-D view from pictorial views.
4	Apply the visualization skill to draw a simple isometric projection or view from given orthographic views

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Unit 1: Introduction to Engineering Graphics	7		1
Principles of Engineering Graphics and their significance, Need of Engineering Graphics and design, Sheet layout, Line types and dimensioning and simple geometrical constructions, usage of Drawing instruments, Introduction to scales. **Engineering Curves :** a) Conic Section : Construction of ellipse, parabola & hyperbola by various methods b) Engineering Curves : Construction of cycloid, Involute of circle and Archimedean Spiral. **Introduction to Basic principles of Orthographic Projections:**. Methods of projections ,1st angle, and 3rd angle method of projection Projection of Points, Lines and Planes (Using first angle method of projection only)			
Unit 2: Isometric Projections	8		2
Projection of Planes.- Triangular, Square, Rectangular, Pentagonal, Hexagonal, and Circular planes inclined to both HP and VP. (Exclude composite planes, true shapes) **Projection of Solids** - Projections of Prisms, Pyramids, Cylinder and Cones, axis inclined to HP or VP and parallel to other plane, two steps only (Excluding frustum and sphere Composite, Hollow solids.)			
Unit 3: Orthographic Views	7		3
Orthographic Views -Fundamentals of orthographic projections. Different views of a simple machine part as per the first angle projection method recommended by I.S			
Unit 4: Isometric Projection and Views	7		4
Isometric Projection and Views -Principles of Isometric projection–Isometric Scale, Isometric Views, Conversion of Orthographic Views to Isometric Views (Excluding Sphere). -Arrangement of two solids with their axis vertical and coinciding.			

References:
Text Books Recommended:
1 Bhatt .N.D. and Panchal V.M. (2016) ”Engineering Drawing”, Charotar Publications Anand, India
2. Dhawan R.K. (2000) “A Textbook of Engineering Drawing”, S.Chand, New Delhi.

Reference Books Recommended:
1. Jolhe D.A. (2015) ,”Engineering Drawing”, Tata McGraw Hill, New Delhi.
2. Shah P.J., (2012), “Basics of Engineering Graphics”, S.Chand, New Delhi
3. P.S.Gill, (2015), “Engineering Drawing”, S.K.Kataria and Sons.

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B.TECH. MECHANICAL ENGINEERING

Sem: I	Total Hours Distribution per week		
Total Credit :1	Practical (P): 2 Hrs.		
Subject Code	BME1P03	Engineering Graphics Lab	
Examination Scheme - Practical			
Internal Marks:	University Marks:	MinimumPassing Marks:	Examination Duration:
50 Marks	-	25 Marks	--

Practical Course Outcomes	
After completing the practical course, students will be able to	
1	Draw the fundamental engineering objects using basic rules and able to construct the lines, simple geometries. Construct the various engineering curves using the drawing instruments.
2	Draw two dimensional and three dimensional objects, precisely using drawing equipment.
3	Draw the development of lateral surfaces for cut section of geometrical solids precisely using drawing equipment.
4	Draw a simple isometric projection from given orthographic views precisely using drawing equipment.

LIST OF PRACTICAL:

Pr. No.	List of Practical
1	Construct any Engineering Curve using any method
2	Projection of Straight Lines
3	Minimum Four problems on Projection of Planes.
4	Minimum Four problems on Projection of Solids.
5	CAD Software Practical Session List of Laboratory Practical -Introduction to 2D and 3D computer aided drafting packages -Evolution of CAD, Importance of CAD, Basic Commands - Edit, View, Insert, Modify, Dimensioning Commands, setting and tools etc. and its applications to construct the 2D and 3D drawings Can be utilized to teach the basic commands of any drafting package, by using this knowledge students shall be able to complete the five assignments on the CAD software. (Minimum 4 problems in each sheet)
6	• Orthographic view of any machine elements. • Draw Isometric view for given orthographic views. • Draw the isometric or Orthographic view of a product/object (For example Workshop Job prepared during the workshop practice or any product developed during the first year session.)

References:
Text Books Recommended:
1 Bhatt .N.D. and Panchal V.M. (2016) "Engineering Drawing", Charotar Publications Anand, India
2. Dhawan R.K. (2000) "A Textbook of Engineering Drawing", S.Chand, New Delhi.

Reference Books Recommended:
1. Jolhe D.A. (2015) ,"Engineering Drawing", Tata McGraw Hill, New Delhi.
2. Shah P.J., (2012), "Basics of Engineering Graphics", S.Chand, New Delhi
3. P.S.Gill, (2015), "Engineering Drawing", S.K.Kataria and Sons.

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FACULTY OF SCIENCE & TECHNOLOGY
B.TECH. MECHANICAL ENGINEERING

Sem: I		Total Hours Distribution per week	
Total Credit : 3		Lecture (L): 3 Hrs	Tutorial/Activity (T/A): 0 Hr.
Subject Code		BME1T04	C-Programming
		Examination Scheme	
		Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
		30 Marks	70 Marks	45 Marks	3 Hours

Course Objectives	
1	To to apply knowledge of basic concepts of programming in C to solve mechanical Engineering problems

Course Outcomes	
After completion of syllabus, students would be able to	
1	Understand and explore concepts in basic programming like data types, input/output functions, operators, programming constructs and user defined functions.
2	Develop capabilities of writing „C" programs in optimized, robust and reusable code
3	Apply appropriate concepts of data structures like arrays, structures implement programs for various applications

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
UNIT 1: Introduction to C programming			
BasicstructureofCprogram,FeaturesofClanguage,Characterset,Ctokens,KeywordsandIdentifiers,Constants,Variables,Datatypes	7		1
UNIT 2: Operators and Expressions:			
Arithmetic operators, Relational operators,Logical Operators,Assignment operators,Increment and decrement operators ,Conditional operators, Bitwise operators, Arithmetic expressions.Evaluation of expressions,Precedence of arithmetic operators, Type conversion in expressions, Operator precedence and associativity.	8		2

UNIT 3: Decision Making:			
Decision making with 'if' statement, Simple 'if' statement, the 'if…else' statement, nesting of 'if…else' statements, The 'else if' ladder, The 'switch' statement. The while statement, The do while statement, The 'for' statement, Jumps in loops.	8		3
UNIT 4 Arrays:			
One dimensional arrays, Declaration of one dimensional arrays. Initialization of one dimensional arrays, Two dimensional arrays, Initializing two dimensional arrays. Declaring and Initializing String Variables, Reading Strings from Terminal, Writing strings to screen, String handling functions.	4		5

References:

Text Books Recommended:

1) Programming in C , P. Dey, M. Ghosh, First Edition, 2007, Oxford University press, ISBN (13): 9780195687910.

2. The C Programming Language, Kernighan B.W and Dennis M. Ritchie, Second Edition, 2005, Prentice Hall, ISBN (13): 9780131101630.

3. Turbo C: The Complete Reference, H. Schildt, 4th Edition, 2000,Mcgraw Hill Education, ISBN-13: 9780070411838.

4. Understanding Pointers in C, Yashavant P. Kanetkar, 4th Edition, 2003, BPB publications, ISBN-13: 978-8176563581

5. C IN DEPTH, S.K Srivastava, Deepali Srivastava, 3rd Edition, 2013, BPB publication, ISBN9788183330480

Reference Books Recommended:

1. An Introduction to Data Structures with Applications, Trembly J. P. And Sorenson P. G., Tata McGraw Hill Pub. Co. Ltd.

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B.TECH. MECHANICAL ENGINEERING

Sem: I	Total Hours Distribution per week		
Total Credit :1	Practical (P): 2 Hrs.		
Subject Code	BME1P04	C-Programming	
Examination Scheme – Practical			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
25 Marks	25 Marks	25 Marks	--

List of Experiments:

Exp. No.	List of Experiments:
1	Development of programs in C To find area/surface area, volume for Planes, Solids. (Applications for cost involved for painting surface of any plane(square, rectangular, hexagonal etc), costing based on metal sheet material required for manufacturing cylinder(ends open/closed/one end open), cone, cube etc. with varying quantity of products)
2	Development of programs in C To find Stress with given force and cross sectional area (square, rectangle, circular etc)
3	Development of programs in C To find angular velocities and acceleration of the output and coupler link for four bar chain mechanism.
4	Development of programs in C for given inner, outer radii for single plate clutch and axial force calculate minimum, maximum, and average pressure acting on clutch plate.(or calculating inner outer radii, width of friction lining, axial force etc. for single/multi plate clutch or similar type of simple calculation programme for block brake.
5	Development of programs in C for any Numerical methods like Newton Raphson, Gauss-Elimination, Gauss-Jordan, Crout's method and Gauss-Seidel Method. Development of programs in C / C++ for any Numerical methods like Taylor's series method, Runge Kutta method, Euler's modified method, Milne's predictor corrector method, Iterative methods for eigen value & eigen vector determination.
6	Development of programs in C To determine type of flow of fluid(laminar/turbulent/transient) on the basis of Reynolds's Number
7	Development of programs in C To calculate specific density, specific weight, weight if specific gravity is given for liquid
8	Development of programs in C for Addition, Multiplication Matrices.

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FACULTY OF SCIENCE & TECHNOLOGY
B.TECH. MECHANICAL ENGINEERING

Sem: I	Total Hours Distribution per week		
Total Credit : 1	**Lecture (L): 1Hrs**	**Tutorial/Activity (T/A): 0 Hr.**	
Subject Code	**BAE1T01**	**Communication Skills**	
Examination Scheme			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
15 Marks	**30 Marks**	**23 Marks**	**2 Hours**

Course Objectives	
1	Students would be able to enhance their communication skills.

Course Outcomes	
After completion of syllabus, students would be able to	
1	Construct grammatically correct sentences.
2	Identify and overcome barriers of communication.
3	Demonstrate good Listening and speaking skills.
4	Develop effective reading and writing skills.

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	**T/A**	**CO**
UNIT 1			
Grammar: Tenses and its types, sentences and its Types, Transformation of Sentences (Assertive, Affirmative, Negative, Interrogative, Exclamatory) Reported speech	4		1
UNIT 2			
Introduction to Communication, Importance of communication Types of communication - Verbal and non-verbal Communications: - Kinesics, Vocalics, Chronemics, Haptics, Proxemics), Barriers to communication and methods to overcome them.	3		2
UNIT 3			
Introduction to LSRW Skills-, Listening Skills: Importance of listening, Types of listening, listening barriers and methods to overcome, Speaking Skills: Components of public speaking, Essential steps for public speaking, Overcoming stage fear in public speaking, Do's, and Don'ts of Public speaking	4		3

UNIT 4Remedial Vaastu			
Reading Skills: Importance of reading skills, Types of reading, omprehending passages, Writing Skills: Importance of effective writing, Paragraph writing, Email etiquettes.	3		4

References Books

1. Technical Communication by Meenakshi Raman and Sangeeta Sharma, OUP
2. Public Speaking and Influencing Men in Business by Dale Carnegie 3. Professional Communication Skills by Bhatia and Sheikh, S. Chand Publications
4. Communication Skills by Sanjeev Kumar and Pushpalata, OUP
5. Communication Skills by LalitaBisen, Bhumika Agrawal, N. ThejoKalyani, HimalayaPublishing House

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FACULTY OF SCIENCE & TECHNOLOGY
B.TECH. MECHANICAL ENGINEERING

Sem: I	Total Hours Distribution per week		
Total Credit :1	**Practical (P): 2 Hrs.**		
Subject Code	**BAE1P01**	**Communication Skills**	
Examination Scheme - Practical			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
25 Marks	**25 Marks**	**25 Marks**	**--**

List of Experiments: Any 8 experiments

Exp. No.	List of Experiments:
1	Barriers to Communication
2	Non-verbal Communication
3	Listening Skills
4	Reading Skills
5	Speaking Skills
6	Presentation Skills
7	Group Discussion
8	Interview Techniques
	Beyond/Additional Syllabus Experiments
9	Development of Word Power
10	Use of Figurative language

Textbooks/Reference Books
1 Technical Communication by Meenakshi Raman and Sangeeta Sharma, OUP
2 Public Speaking and Influencing Men in Business by Dale Carnegie
3 Professional Communication Skills by Bhatia and Sheikh, S. Chand Publications
4 Communication Skills by LalitaBisen, Bhumika Agrawal, N.ThejoKalyani, Himalaya

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FACULTY OF SCIENCE & TECHNOLOGY
B.TECH. MECHANICAL ENGINEERING

Sem: I	Total Hours Distribution per week		
Total Credit :2	Practical (P): 4 Hrs.		
Subject Code	BVS1P01	Workshop Practices	
Examination Scheme - Practical			
Internal Marks:	University Marks:	MinimumPassing Marks:	Examination Duration:
50 Marks	50 Marks	50 Marks	--

Sr. No.	Course Objective The objective of this course is–
1	To understand various workshop tools, techniques, applications and how the industry functions and its expectations
Course Outcomes	
After the successful completion of this course the students are able to:	
CO1	Understand Welding Techniques,piping , Fitting, electrical fittings & Carpentry and to understand their Tools, Types, Applications

Contents
Welding Types of welding Equipment used for welding Tools used for welding Safety considerations during operations
Carpentry Equipment used for Carpentry Tools used for Carpentry Safety considerations during operations
Fitting Equipment used for Fitting Tools used for Fitting Safety considerations during operations
Piping Equipment used for Piping Tools used for Piping

Safety considerations during operations
Electrical Fittings Tools used for fitting operations Safety considerations during operations

- Safety shoes and Aprons are compulsory

- Medical Kits should be available in workshop at all times for at least 10 people

List of Experiments: Performance of at least any eight experiments is compulsory in a semester.

Exp. No.	List of Experiments
1	One simple fitting Job
2	One simple carpentry job
3	One simple welding job
4	One assembly and dissembly of lathe machine part
5	One simple plumbing job
6	Electrical, maintenance schedule and charts for household appliances

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Sem: II	Total Hours Distribution per week		
Total Credit : 3	Lecture (L): 3 Hrs	Tutorial/Activity (T/A): 0 Hr.	
Subject Code	BME2T05	Mathematics – II (Applied Mathematics)	
Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks	70 Marks	45 Marks	3 Hours

Course Objectives	
1	The objective of the course is to inculcate and strengthen analytical ability among the engineering students and to create zeal of working with higher mathematics and its applications in the extensive field of engineering. The topics covered will serve as the basic tool for specialized studies in the field of engineering and technology.

Course Outcomes	
After completion of syllabus, students would be able to	
1	Apply different methods to solve Algebraic and Transcendental Equations.
2	To understand the various methods suitable and apply to solve the system of simultaneous linear equations.
3	To solve ordinary differential equations numerically by using the various methods and formulae.
4	To solve the problems having unequal and equal interval data by using suitable formula and fitting of curve using the given data.
5	Solving the problems of differentiation and integration numerically.

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Unit-1 Solution of Algebraic and Transcendental Equations			
Types of iterative methods: Bisection method, Method of False position, Newton Raphson method and their convergence, Newton Raphson method for multiple roots, Direct iteration method.	7		1
Unit 2: Solution of system of simultaneous linear equations			
Gauss elimination method, Gauss Seidel method, Gauss Jordan method, Crout's method Largest Eigen value and its corresponding Eigen vector by iteration method.	6		2

Unit 3: Numerical solution of Ordinary differential equations			
Taylor's series method, Picards method, Euler's modified method, Rungekutta method of 4th order, Milne's Predictor-Corrector method, RungeKutta method to solve simultaneous first order differential equations.	10		3
Unit 4: Interpolation			
Lagranges interpolation formula for unequal intervals, Newton's Forward and backward difference formula, Stirling central difference formula, Curve fitting.	8		4
Unit-5:Numerical Differentiation and Integration			
Numerical Differentiation: Forward, Backward and Central difference formula, Numerical Integration: Trapezoidal rule, Simpson's $1/3^{rd}$ rule, Simpson's $3/8^{th}$ rule.	6		5

Text/Reference Books:
(1) Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
(2) Ramana B.V., Higher Engineering Mathematics, Tata Mc-Graw Hill, New Delhi, 11th Reprint, 2010.
(3) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi
Publications, Reprint, 2008.
(4) B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
(5) P. N. Wartikar and J. N. Wartikar, Applied Mathematics, Volume I and II.
(6) H.K Dass, Rama Verma, RajnishVerma, V.J. Dagwal, Sajid Anwar and D.F. Shastrakar, Engineering Mathematics, Volume I and II, S. Chand.

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B.TECH. MECHANICAL ENGINEERING

Sem: II	Total Hours Distribution per week		
Total Credit :1	Practical (P): 2 Hrs.		
Subject Code	BME2P05	Numerical Methods	
Examination Scheme - Practical			
Internal Marks:	University Marks:	MinimumPassing Marks:	Examination Duration:
25 Marks	25 Marks	25 Marks	--

Practical Course Objectives	
1	Solving problems using Open-Source Software SCILAB Programming Language

Practical Course Outcomes	
After completing the practical course, students will be able to solve the following using SCILAB Programming Language.	
1	Algebraic and Transcendental Equations by iterative methods.
2	System of simultaneous linear equations by iterative methods and direct methods.
3	Largest Eigen value and its Eigen vector of a matrix by iteration method.
4	Ordinary differential equations numerically by using the various iterative methods.
5	Interpolation Problems of unequal interval data and equal interval data.
6	Problems of numerical differentiation and integration for equal interval data.

LIST OF PRACTICALS: Performance of at least **SIX** practical is compulsory in a semester.

Pr. No.	List of Practicals
	Unit-1 Solution of Algebraic and Transcendental Equations (06 Hours)
1	Write a SCILAB Program to solve Algebraic and Transcendental Equations by one of the iterative methods: Bisection method, and Method of False position.
2	Write a SCILAB Program to solve Algebraic and Transcendental Equations by one of the iterative methods: Newton Raphson method, Newton Raphson method for multiple roots and Direct iteration method.
	Unit 2: Solution of system of simultaneous linear equations: (04 Hours)
3	Write a SCILAB Program to solve the system of simultaneous linear equations by one of the iterative methods: Gauss Jordan method, and Gauss seidel method,
4	Write a SCILAB Program to solve the system of simultaneous linear equations by one of the direct methods: Gauss elimination method, and Crout's method
5	Write a SCILAB Program to findtheLargest Eigen value and its corresponding Eigen vector of a matrix by iteration method.
	Unit 3: Numerical solution of Ordinary differential equations: (04 Hours)

6	Write a SCILAB Program to solve ordinary differential equations numerically by the iterative method: Euler's modified method
7	Write a SCILAB Program to solve ordinary differential equations numerically by the iterative method: Rungekutta method of 4th order
8	Write a SCILAB Program to solve ordinary differential equations numerically by the iterative method: Milne's Predictor-Corrector method
	Unit 4: Interpolation: (04 Hours)
9	Write a SCILAB Program to solve the Interpolation Problems for unequal interval data by the formula: Lagranges interpolation formula
10	Write a SCILAB Program to solve the Interpolation Problems for unequal interval data by one of the formulas: Newton's Forward and backward difference formula, Stirling central difference formula
	Unit-5: Numerical Differentiation and Integration: (06 Hours)
11	Write a SCILAB Program to solve the problem of Numerical Differentiation by one of the formulas: Forward, Backward and Central difference formula
12	Write a SCILAB Program to solve the problem of Numerical Integration by one of the formulas: Trapezoidal rule, Simpson's $1/3^{rd}$ rule, Simpson's $3/8^{th}$ rule.

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Sem: II	Total Hours Distribution per week		
Total Credit: 3	Lecture (L): 3Hrs	Tutorial/Activity (T/A): 0 Hr.	
Subject Code	BME2T06	Applied Chemistry	
Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks	70 Marks	45 Marks	3 Hours

Course Objectives	
1	To create awareness about various materials used in modern technology and their interaction amongst themselves as well as environment
2	To make students learn about the environment and ensuring sustainable development.

Course Outcomes	
After completion of syllabus, students would be able to	
1	Apply the basics concepts of electrochemistry& corrosion technology.
2	Know about fuels and lubricants and analyse the situation for their appropriate applications.
3	Analyze the various industrial problems arising due to water quality and their remediation.
4	Develop the environmental awareness from the basics of green chemistry and its application.
5	Inculcate the use of instrumentation techniques and interpret its applications in material characterization.

SYLLBUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Unit-1: Electrochemistry and Corrosion Technology			
A] Electrochemistry: Electrochemical & Galvanic Series, Electrochemical & Electrolytic cell, Battery: Introduction, types, characteristics, components/materials, working and applications of Lithium-cobalt oxide and metal air batteries. Super capacitors: Introduction, types (EDLC, pseudo and asymmetric capacitor) with examples and applications. Energy conversion devices: Introduction, characteristics, materials, working and applications of H_2-O_2 fuel cells, amorphous Si and quantum dye sensitized solar cells.	4		1
B] Corrosion: Theories of Corrosion (Dry, Wet and Differential Aeration), Pilling-Bedworth Rule & Numerical, Factors affecting corrosion, Types of Corrosion (Intergranular& Stress), Corrosion Protection- Design & Material Selection, Cathodic Protection (Galvanic & Impressed Current)	3		

Unit-2: Fuels & Lubricants			
A] Fuels: Introduction: Calorific value, Higher and lower calorific value; determination of calorific value by Bomb and Boy's calorimeter; numerical based on calorific value determination;	4		2
Liquid fuels –fractional distillation of crude petroleum(boiling point wise separation only) use of gasoline and diesel in internal combustion engine: knocking and chemical constitution of fuel, Octane and Cetane number, doping agents, Introduction to propellants and its classification.	3		
Unit-3: Water Technology			
A] Water Purification Technology: Principles of coagulation and flocculation, Sterilization by using ozone and chlorine (Cl_2 gas & chloramine), Break point chlorination and its significance.	3		3
Industrial Water Treatment: Softening of water-principle- reactions, advantages, limitations and comparison of Zeolite process, and De-mineralization process. Numerical based on Zeolite process.	2		
B] Boiler Troubles–Causes, effect on boiler operation and methods of prevention – Scales and sludges, Caustic embrittlement. Desalination of sea water- Principle, method and advantages of electro dialysis and reverse osmosis processes	2		
Unit-4: Green Chemistry			
A] Green Chemistry: Introduction, twelve principles of Green chemistry with examples, Numerical based on atom economy, Carbon sequestration & Carbon Credits	3		4
B] Green reagents, Dimethyl carbonate and its applications, Supercritical carbon dioxide properties and applications	2		
Biopolymers: Classification based on type, properties and applications of collagen, chitosan, starch.	2		
Unit – 5: Material Characterisation Techniques			
Principles and applications of –			
A] Electronic Spectroscopy (Beer-Lambert's law and its numerical), Infra-Red spectroscopy and Nuclear Magnetic Resonance spectroscopy.	4		5
B] Thermal analysis (Thermogravimetry, Differential Thermal Analysis, Differential Scanning Calorimetry), Scanning Electron Microscopy, Transmission Electron Microscopy, Atomic Force Microscopy, Brunauer-Emmett-Teller (BET) surface area analysis, X-ray Diffraction Analysis, particle size analyser (Dynamic Light Scattering), High Performance Liquid Chromatography and Gas Chromatography	3		

References/ Text Books
1. Engineering Chemistry, S S Dara, S Chand Publication
2. Engineering Chemistry, Jain & Jain, DhanpatRai Publication
3. Applied Chemistry, A V Bharati, Das Ganu Publication
4. Energy & Environment, A V Bharati, Das Ganu Publication
5. Spectroscopy, Y R Sharma, S Chand
6. Green Chemistry for Beginners, Anju Srivastava, Rakesh K. Sharma, Jenny Stanford Publishing
7. Instrumental Methods of Chemical Analysis, B. K. Sharma, Krishna Prakashan.
8. https://wiki.anton-paar.com/in-en/the-principles-of-dynamic-light-scattering/
9. Fundamentals of Solid Propellant Combustion, Kuo, K.K., Summerfield, M., Progress in Astronautics & Aeronautics, Vol. 90, AIAA. 1984
10. https://onlinecourses.nptel.ac.in/noc24_ae09/preview

Semester	Course Title (Subject)	Hours / Week			Credits	Maximum Marks		
		L	T	P		Continual Assessment	University Examination	Total
I	**ENGINEERING CHEMISTRY**	**0**	**0**	**02**	**01**	**25**	**25**	**50**

List of Practical's

Sr. No.	List of Practical (Any 6 performance based and 1 virtual lab experiment)
01	Proximate Analysis of coal
02	Estimation of viscosity of oil by Redwood Viscometer 1 or 2
03	Estimation of Flash point of lubricating oil by open/ closed cup apparatus
04	Estimation of Acid value of lubricant
05	Estimation of Consistency of grease by penetrometer
06	Estimation of Saponification value of lubricant
07	Estimation of Hardness of water (Total, Permanent & Temporary) by complexometry
08	Estimation of Alkalinity of water (Warder's Method)
09	Estimation of DO / free chlorine estimation
10	Estimation of Copper estimation (iodometrically)
11	Estimation of Ni by complexometry / gravimetry.
12	Fe(II)/ (III) estimation by redox titration.
13	Beer's Law verification by spectrophotometer.
14	Separation of copper nickel ions by paper chromatography.
15	Acid base titration by potentiometry
16	Acid base titration by conductometry
17	Virtual Lab: Experiment on Calorimetry
18	Virtual Lab: Experiment on Spectroscopy

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B.TECH. MECHANICAL ENGINEERING

Sem: II	Total Hours Distribution per week		
Total Credit: 3	**Lecture (L): 3 Hrs**	**Tutorial/Activity (T/A): Hrs.**	**Practical (P): 2 Hrs.**
Subject Code :	**BME2T07**	**Name of Subject: Engineering Mechanics**	
Examination Scheme			
Internal Marks:	**University Marks:**	**Maximum Passing Marks:**	**Examination Duration:**
30 Marks	**70 Marks**	**45 Marks**	**3 Hours**

Course Objective	
1	To make the students understand difference between static & Dynamic nature of forces
2	To make the students understand the nature and effects of forces

List of Course Outcome	
After completion of syllabus student able to	
1	To understand concept of Force system on a body & its resolution
2	To understand attainment of equilibrium in various planes and space
3	To understand Friction & its effects in various areas
4	To understand concept of Moment of Inertia and its application & use on various planes
5	To understand difference between static and dynamic forces on a body

SYLLBUS

Syllabus- (Theory,) 1st Semester , Engineering Mechanics -Mechanical Engineering	
Contents	No of hours
Unit I Resolution and Composition of Forces system Principle of statics, Concept of Force system, Resolution and composition of forces, Resultant of concurrent forces. moment of a force about a point and about an axis, couple, resolution and compositions of coplanar force system, reduction of system of forces into a force and a couple equivalent force system, Varignon's theorem, resultant of parallel force system, , Equivalent force couple system, Resultant of parallel general force system ,	**07**

Unit II Equilibrium Free body diagram Equilibrium of concurrent, problems of equilibrium involving co-planar force system acting on a particle, parallel forces in a plane Equilibrium of general forces in a plane Equilibrium of three forces in a plane, Types of beams, simple and compound beams, Type of supports and reaction, Forces in space, rigid body and system of rigid bodies, problems of equilibrium of non-coplanar concurrent force system. Resultant of concurrent and parallel forces in a space, Equilibrium of concurrent and parallel forces in a space.	**07**
Unit III Friction and Analysis of Structures Friction- Laws of friction, application of friction on inclined planes Wedges and ladders friction, Application to flat belt , Coulomb's law of friction, static belt friction. Analysis of structures- Analysis of plane trusses by Method of joints Analysis of plane trusses by method of section.	**07**
Unit IV Centroid and Moment of Inertia First moment of an area and centroid, second moment and product of area, transfer theorems, polar moment of inertia, radius of gyration, definition of principle axes and principle moment of inertia of regular figures such as: triangle, rectangle, circle, semi-circle, quarter circle..	**07**
Unit V Kinetics of Particle Kinetics of rectilinear and circular motion of a particle acted upon by constant and variable force system, D'Alembert's principle, concept of dynamic equilibrium, rectilinear motion of several interconnected particles Kinetics of rigid body rectilinear translation, rotation about a fixed axis of rigid body. Work, power, energy, conservative and non-conservative forces Conservation of energy for motion of particle, Impulse, Momentum, Direct central impact. Coefficient of restitution, Impulse Momentum principle of particle.	**07**

References/ Text Books
1. Vector Mechanics for Engineers: Statics and Dynamics, Johnston. R.E., Beer. F., Eisenberg. E. R,&Mazurek. D., McGraw Hill
2. Engineering Mechanics: Principles of Statics and Dynamics, R. C. Hibbler, Pearson Press
3. Engineering Mechanics, S SBhavikatti,Newage International publication

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B.TECH.MECHANICAL ENGINEERING

Sem: II	Total Hours Distribution per week		
Total Credit :1	**Practical (P): 2 Hrs.**		
Subject Code	**BME2P07**	**Engineering Mechanics Lab**	
Examination Scheme – Practical			
Internal Marks:	**University Marks:**	**Minimum Passing Marks:**	**Examination Duration:**
25 Marks	**25 Marks**	**25 Marks**	**--**

List of Experiments: Performance of at least Any eight experiments is compulsory in a semester.

Exp. No.	List of Experiments
1	Verification of law of parallelogram of forces/polygon of forces.
2	To determine support reaction of simple/compound beams.
3	Determination of coefficient friction of belt/inclined plane.
4	To determine forces in the members of space force system.
5	To study the curvilinear motion.
6	Determination of coefficient of restitution
7	Numerical on Design of clutches and brakes
8	Numerical on Design of springs under static and variable loads.

List of Tutorials/ Assignments
Group B
Assignment of five problems on every unit to be solved during practical

List of Tutorials/ Assignments
Group C
Any two assignments of the following by graphical method using any drawing software.
a) To determine the resultant of general force system.
b) To determine unknown forces of concurrent force system
c) To determine the forces in the member of the plane truss
d) To determine velocity and acceleration of particle from given s-t diagram

Books & Other Resources:
Text Books:
1. Vector Mechanics for Engineers, by F. P. Beer and E. R. Johnson, McGraw-Hill Publication
2. Engineering Mechanics by R. C. Hibbeler, Pearson Education
Reference Books:
1. Engineering Mechanics by S. P. Timoshenko and D. H. Young, McGraw- Hill publication
2. Engineering Mechanics by J. L. Meriam and Craige, John Willey
3. Engineering Mechanics by F L Singer, Harper and Rowe publication
4. Engineering Mechanics by A. P. Boresi and R. J. Schmidt, Brooks/Cole Publication

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Sem: II	Total Hours Distribution per week	
Total Credit : 2	Lecture (L): 2 Hrs	Tutorial/Activity (T/A): 0 Hr.
Subject Code	BME2T08	Basics of Mechanical Engineering
Examination Scheme		
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks	70 Marks	45 Marks	3 Hours

Course Objectives	
1	To introduce manufacturing processes and applying proper methods to produce components.
2	To introduce machining processes and applying proper methods to produce components.
3	To get knowledge about various energy sources and it's conversions.
4	To get acquainted with vehicle system.

Course Outcomes	
After completion of syllabus, students would be able to	
1	Understand several manufacturing processes and identify the suitable process.
2	Understand several matching processes and identify the suitable process.
3	Understand various energy resources and energy conversion devices
4	Get acquainted with vehicle system.

SYLLABUS

SYLLABUS- Basics of Mechanical Engineering	
Contents	No of hours
Unit I **Introduction of Manufacturing process**: Casting (sand mould casting, permanent mould casting), Forming (forging, rolling, extruding, and drawing), Sheet metal working Metal joining: Welding (arc welding, gas welding), soldering, welding products.	06
Unit II **Introduction of Machining process**: metal cutting processes (turning, drilling, milling, boring, grinding), electrochemical machining, electro discharge machining Introduction of 3 D printing, Introduction of Nc, CNC machines.	06
Unit III **Introduction of energy sources and it's conversion:** Conventional energy sources (working of thermal and hydroelectric power plant) and renewable energy sources (solar energy, wind, tidal, geothermal and nuclear energy)	06

Energy conversion devices: Introduction of water pump, introduction of steam turbine, introduction of air compressor	
Unit IV Introduction of bearing, couplings, clutches and brakes. **Vehicles and their specifications**: Classification of automobile, Vehicle specifications of two/three wheelers, light motor vehicle, truck, buses and multi-axel vehicles. Introduction of engine components and introduction to engine specifications. Vehicle system: Introduction of chassis layouts, steering system, suspension, braking system, cooling system, fuel injection system and fuel supply system, Introduction of power transmission system.	06

References:
Text Books Recommended:
1. Manufacturing Science, Ghosh & Malik, East West Press.
2. Advanced Machining Processes, V.K. Jain, Allied Publishers.
3. Elements of Workshop Technology, Volume I and II, Chaudhary and Hajara, Media promoters and publishers
4. Non-conventional energy sources, G. D. Rai, Khanna Publications.
5. Engineering Thermodynamics. R. K Rajput, Laksmi Publications Pvt, Ltd.
6. Automobile Engineering Vol. I & II, Kirpal Singh, Standard Publishers
7. Automobile Engineering, Ramakrishna, PHI Learning Pvt. Ltd.
8. Engineering Thermodynamics.
9. Thermal Engineering, R. K. Rajput, Laxmi publications.
10. A Course in Thermal Engineering, Anand Domkundwar, C.P. Kothandaraman, S. Domkundwar, Dhanpat Rai & Sons.
11. A Course in Power Plant Engineering, Arora & V.M. Domkundwar, Dhanpat Rai &
Sons.

Reference Books Recommended:
1. Advanced Machining Processes (Non-Traditional and Hybrid Machining Processes), Hassan
   El-Hofy, McGraw Hill.
2. Non-Traditional Manufacturing Processes, G.F.Benedict, Marcel Dekker, New York.
3. Manufacturing Engineering & Technology, Serope Kalpakjian, Pearson.
4. Manufacturing Science, M. l. Khan, PHI.
5. Casting Technology & Casting Alloys, A.K. Chakraborty, PHI
6. Automobile Engineering, R.K.Rajput, Laxmi Publications
7. Automobile Engineering R.B. Gupta, Satya Prakashan New Delhi
8. Thermal Engineering, M.M. Rathore, TMH
        9. Power Plant Engineering, A.K. Raja, Shrivastava and Dwivedi, New age International Publishers