RKDF UNIVERSITY RANCHI

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING
(B.TECH. ME)

2023 Onwards

RKDF UNIVERSITY RANCHI

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

GENERAL COURSE STRUCTURE & THEME AS PER AICTE

A. Definition of Credit:

1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (T) per week	1 Credit
1 Hr. Practical (P) per week	0.5 Credit
2 Hours Practical (P) per week	1 Credit

B. Range of Credits: In the light of the fact that a typical Model Four-year Under Graduate degree program in Engineering has about 160 credits, the total number of credits proposed for the four-year B. Tech/B.E. in Mechanical Engineering (Engineering & Technology) is kept as 160.

C. Structure of UG Program in ME: The structure of UG program in Mechanical Engineering is the following categories of courses with the breakupof credits as given:

S.No.	Category	Breakup ofCredits (Total 160)
1	Humanities and Social Sciences including Management courses	13
2	Basic Science courses	23
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.	27
4	Professional core courses	59
5	Professional Elective courses relevant to chosen specialization/branch	12
6	Open subjects – Electives from other technical and /or emerging subjects	9
7	Project work, seminar and internship in industry or elsewhere	16
8	Mandatory Courses [Sports & Yoga/NSS/NCC, Induction Program, Indian Constitution, Essence of Indian Knowledge Tradition]	1
	Total	**160**

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BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

COMMON TO ALL BRANCHES

Credit System and Marks Distribution:-

Semester-I

SL. No.	Category	Subject Code	Subject Name	Periods			Credits	Marks Distribution				
								Internal	External		Total	
				L	T	P		Max	Max	Min	Max	Min
1	**Basic Science Course**	BT101	Engineering Chemistry	3	0	0	**3**	40	60	18	100	35
2	**Basic Science Course**	BT102	Engineering Mathematics-I	3	1	0	**4**	40	60	18	100	35
3	**Humanities and Social Science**	BT103	Technical Communication	2	0	0	**2**	40	60	18	100	35
4	**Engineering Science Course**	BT104	Basic Electrical & Electronics Engineering	3	0	0	**3**	40	60	18	100	35
5	**Engineering Science Course**	BT105	Engineering Graphics & Design	2	0	0	**2**	40	60	18	100	35
6	**Humanities and Social Science**	BT106	Universal Human Value-2	3	0	0	**3**	40	60	18	100	35
PRACTICAL DEMONSTRATION												
1	**Basic Science Course**	BT151	Engineering Chemistry Lab	0	0	2	**1**	30	20		50	25
2	**Engineering Science Course**	BT 154	Basic Electrical & Electronics Engineering Lab	0	0	2	**1**	30	20		50	25
3	**Engineering Science Course**	BT 155	Engineering Graphics & Design Lab	0	0	2	**1**	30	20		50	25
4	**Engineering Science Course**	BT156	Workshop/ Manufacturing Practices	0	0	4	**2**	30	20		50	25
TOTAL				16	1	10	**22**					

2023 Onwards

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BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

RKDF UNIVERSITY RANCHI

COMMON TO ALL BRANCHES

Credit System and Marks Distribution:-

Semester-II

SL. No.	Category	Subject Code	Subject Name	Periods			Credits	Marks Distribution				
				L	T	P		Internal	External		Total	
								Max	Max	Min	Max	Min
1	**Basic Science Course**	BT201	Engineering Physics	4	0	0	**4**	40	60	18	100	35
2	**Basic Science Course**	BT202	Engineering Mathematics-II	3	1	0	**4**	40	60	18	100	35
3	**Engineering Science Course**	BT203	Basic Mechanical Engineering	2	0	0	**2**	40	60	18	100	35
4	**Engineering Science Course**	BT204	Basic Civil Engineering & Mechanics	3	0	0	**3**	40	60	18	100	35
5	**Engineering Science Course**	BT205	Programming for Problem Solving With C	2	0	0	**2**	40	60	18	100	35
PRACTICAL DEMONSTRATION												
1	**Basic Science Course**	BT251	Engineering Physics Lab	0	0	2	**1**	30	20		50	25

2	**Engineering Science Course**	BT253	Basic Mechanical Engineering Lab	0	0	2	**1**	30	20		50	25
3	**Engineering Science Course**	BT255	Programming for Problem Solving with C Lab	0	0	4	**2**	30	20		50	25
4	**Engineering Science Course**	BT254	Basic Civil Engineering & Mechanics Lab	0	0	2	**1**	30	20		50	25
5	**Humanities and Social Science**	BT256	Language Laboratory	0	0	2	**1**	30	20		50	25
6	**Audit Course**	BT257	Sports & NSS/Yoga	0	0	2	**1**	30	20		50	25
TOTAL				14	1	10	**22**					

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B. TECH MECHANICAL ENGINEERING

Credit System and Marks Distribution:-

Semester-III												
SL. No.	**Category**	**SubjectCode**	**Subject Name**	**Periods**			**Credits**	**Marks Distribution**				
								Internal	**External**		**Total**	
				L	**T**	**P**		**Max**	**Max**	**Min**	**Max**	**Min**
1	**Basic Science Course**	BT301	Engineering Mathematics – III	4	0	0	**4**	40	60	18	100	35
2	**Professional Core Course**	MEP 302	Strength of Materials	2	1	0	**3**	40	60	18	100	35
3	**Professional Core Course**	MEP 303	Manufacturing Processes	4	0	0	**4**	40	60	18	100	35
4	**Engineering Science Course**	MES 304	Thermodynamics	3	0	0	**3**	40	60	18	100	35
5	**Engineering Science Course**	MES 305	Object Oriented Programming with C++	2	0	0	**2**	40	60	18	100	35
6	**Basic Science Course**	BT 306	Environmental Science	2	0	0	**2**	40	60	18	100	35
PRACTICAL DEMONSTRATION												
1	**Professional Core Course**	MEP 352	Strength of Materials Lab	0	0	2	**1**	30	20		50	25
2	**Engineering Science Course**	MES354	Thermodynamics Lab	0	0	2	**1**	30	20		50	25
3	**Engineering Science Course**	MES355	Object Oriented Programming with C++ Lab	0	0	2	**1**	30	20		50	25
4	**Extra Activity**	BT357	Extra Activities (NSO/NSS/NCC/Yoga/Creative Arts /Mini Project/2 weeks internship)	0	0	2	**1**	30	20		50	25
TOTAL							**22**					

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B. TECH MECHANICAL ENGINEERING

Credit System and Marks Distribution:-

Semester-IV												
SL. No.	**Category**	**SubjectCode**	**Subject Name**	**Periods**			**Credits**	**Marks Distribution**				
				L	**T**	**P**		**Internal**	**External**		**Total**	
								Max	**Max**	**Min**	**Max**	**Min**
1	**Professional Core Course**	MEP 401	Kinematics of Machines	3	0	0	**3**	40	60	18	100	35
2	**Professional Core Course**	MEP 402	Fluid Mechanics & Hydraulic Machines	3	0	0	**3**	40	60	18	100	35
3	**Professional Core Course**	MEP 403	Material Science & Metallurgy	3	0	0	**3**	40	60	18	100	35
4	**Professional Core Course**	MEP 404	Advance Manufacturing Process	3	0	0	**3**	40	60	18	100	35
5	**Professioal Core Course**	MEP 405	Applied Thermodynamics	3	0	0	**3**	40	60	18	100	35
PRACTICAL DEMONSTRATION												
1	**Professional Core Course**	MEP 451	Kinematics of Machines Lab	0	0	2	**1**	30	20		50	25
2	**Professional Core Course**	MEP 452	Fluid Mechanics & Hydraulic Machines Lab	0	0	2	**1**	30	20		50	25
3	**Professional Core Course**	MEP 453	Material Science & Metallurgy Lab	0	0	2	**1**	30	20		50	25
4	**Professional Core Course**	MEP 455	Advance Manufacturing Process Lab	0	0	2	**1**	30	20		50	25
5	**INTERNSHIP**	IN456	Internship/Tour & Training/Industrial training	0	0	0	**1**	30	20		50	25
TOTAL							**20**					

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B. TECH MECHANICAL ENGINEERING
Credit System and Marks Distribution:-

Semester-V

SL. No.	Category	SubjectCode	Subject Name	Periods			Credits	Marks Distribution				
				L	T	P		Internal	External		Total	
								Max	Max	Min	Max	Min
1	PCC	MEP 501	Dynamics of Machinery	3	0	0	3	40	60	18	100	35
2	PCC	MEP 502	Heat Transfer	3	0	0	3	40	60	18	100	35
3	PCC	MEP 503	Internal CombustionEngines	3	0	0	3	40	60	18	100	35
4	PCC	MEP 504	Machine Component Design	3	0	0	3	40	60	18	100	35
5	PEC		Professional Elective-I	3	0	0	3	40	60	18	100	35
6	OEC		Open Elective-I/MOOC-I	3	0	0	3	40	60	18	100	35
Professional Elective-I												
1	PEC	MEPE 505	Design For Manufacturing	3	0	0	3	40	60	18	100	35
2	PEC	MEPE 506	Energy System & Management									
3	PEC	MEPE 507	Machine Tool Design									
Open Elective-I												
1	OEC	CIOE 508	Hydrology & Water Resources	3	0	0	3	40	60	18	100	35
2	OEC	EEEOE 509	Industrial Instrumentation									
3	OEC	CSOE 510	Python Programming									
PRACTICAL DEMONSTRATION												
1	PCC	MEP 551	Dynamics of Machinery Lab	0	0	2	1	30	20		50	25
2	PCC	MEP 552	Heat Transfer Lab	0	0	2	1	30	20		50	25
3	PCC	MEP 553	Internal Combustion Engines Lab	0	0	2	1	30	20		50	25
TOTAL							21					

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B. TECH MECHANICAL ENGINEERING

Credit System and Marks Distribution:-

Semester-VI

SL. No.	Category	Subject Code	Subject Name	Periods			Credits	Marks Distribution				
								Internal	External		Total	
				L	T	P		Max	Max	Min	Max	Min
1	**Professional Core Course**	MEP601	Production & Operation Management	3	0	0	**3**	40	60	18	100	35
2	**Professional Core Course**	MEP 602	Mechanical Measurement & Metrology	3	0	0	**3**	40	60	18	100	35
3	**Professional Core Course**	MEP 603	CAD/CAM	3	0	0	**3**	40	60	18	100	35
4	**HSMC**		HSS/Management Elective-1	3	0	0	**3**	40	60	18	100	35
5	**Open Elective Course**		Open Elective-II/MOOC-II	3	0	0	**3**	40	60	18	100	35
6	**Professional Elective Course**		Professional Elective-II	3	0	0	**3**	40	60	18	100	35
PRACTICAL DEMONSTRATION												
1	**Professional Core Course**	ME 652	Mechanical Measurement & Metrology Lab	0	0	2	**1**	30	20		50	25
2	**INTERNSHIP**	ME653I	Internship/Tour & Training/IndustrialTraining	0	0	4	**2**	30	20		50	25
3	**HSMC**	ME654	Introduction to Soft Skills	0	0	2	**1**	30	20		50	25
TOTAL							**22**					

HSS/Management Elective-I (Any one)												
1	**HSMC**	MEH 604	Project Management	3	0	0	**3**	40	60	18	100	35
2	**HSMC**	MEH605	Operations Research									
3	**HSMC**	MEH606	Managerial Economics									
Open Elective-II (Any one)												
1	**Open Elective Course**	CEO 607	Remote Sensing & GIS	3	0	0	**3**	40	60	18	100	35
2	**Open Elective Course**	EEEO 608	PLC & SCADA									
3	**Open Elective Course**	CSO 609	Soft Computing									
Professional Elective-II (Any one)												
1	**Professional Elective Course**	MEL 610	Renewable Energy Engineering	3	0	0	**3**	40	60	18	100	35
2	**Professional Elective Course**	MEL 611	Computational Fluid Dynamics									
3	**Professional Elective Course**	MEL 612	Additive Manufacturing									

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B. TECH MECHANICAL ENGINEERING
Credit System and Marks Distribution:-

Semester-VII

SL. No.	Category	Subject Code	Subject Name	Periods			Credits	Marks Distribution				
				L	T	P		Internal	External		Total	
								Max	Max	Min	Max	Min
1	**Professional Core Course**	MEP701	Mechatronics, Robotics & Control	3	1	0	**4**	40	60	18	100	35
2	**HSMC**	MEH 702	Industrial Psychology	3	0	0	**3**	40	60	18	100	35
3	**Professional Core Course**	MEP 703	Product Innovation & Entrepreneurship	3	0	0	**3**	40	60	18	100	35
4	**Professional Elective Course**		Professional Elective-III	3	0	0	**3**	40	60	18	100	35
5	**Professional Elective Course**		Professional Elective-IV	3	0	0	**3**	40	60	18	100	35
6	**Open Elective Course**		Open Elective-III	3	0	0	**3**	40	60	18	100	35
7	**PROJ**	ME 754	Project-I	0	0	6	**3**	40	60	18	100	35
8	**SEM**	SEM 755	Seminar	0	0	0	**1**	40	60	18	100	35
Total							**23**					

2023 Onwards

Professional Elective (PEC)-III (Any one)			
S. No	**Category**	**Code**	**Subject**
1	Professional Elective Course	MEL 704	Power Plant Engineering
2	Professional Elective Course	MEL 705	Advance Workshop Practice
3	Professional Elective Course	MEL 706	Mechanical Vibration
Professional Elective (PEC)-IV (Any one)			
S. No	**Category**	**Code**	**Subject**
1	Professional Elective Course	MEL 707	Refrigeration & Air Conditioning
2	Professional Elective Course	MEL 708	Automobile Engineering
3	Professional Elective Course	MEL 709	Food Technology

Open Elective (OEC)-III (Any one)			
S. No	**Category**	**Code**	**Subject**
1	Open Elective Course	CEO 710	AutoCAD
2	Open Elective Course	EEEO 711	Wind & Solar Energy System
3	Open Elective Course	CSO 712	Artificial Intelligence (AI)

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B. TECH MECHANICAL ENGINEERING

Credit System and Marks Distribution:-

Semester-VIII

SL. No.	Category	Subject Code	Subject Name	Periods			Credits	Marks Distribution				
				L	T	P		Internal	External		Total	
								Max	Max	Min	Max	Min
1	**PROJ**	ME851	Project-II	Not Applicable			**8**	40	60	18	100	35

Note- A student can be allowed to do the project outside after the permission of Departmental Academic Committee. Those students doing project outside has to present their project progress every month. Those students doing project outside can be permitted to present progress every fortnight through video conferencing. Students doing project in home has to present their project progress every week.

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BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

R.K.D.F. UNIVERSITY, RANCHI

B.Tech. (Common For All Branches)

New Scheme Based On AICTE Flexible Curricula

Semester – I

Course Content

Branch	Subject Title	Subject Code
B.Tech (Common)	Engineering Chemistry	BT101

Course Objectives:

1. To expose the student to a breadth of experimental techniques using modern instrumentation
2. The students will understand the importance of the periodic table of the elements how it came to be and itsrole in organizing chemical information.
3. The student will learn the laboratory skills needed to design, safely conduct and interpret chemical research.

Module 1

Electrochemistry and Water:

Electrochemistry: Law of chemical equilibrium, equilibrium constants and their significance, Weak and strong electrolytes, Conductors, Insulators , Dielectrics, galvanic cells, Standard electrode potential and its application to different kinds of half cells, Batteries and Fuel Cells with examples, Arrhenius Theory of Ionisation, Degree of Ionisation & factors affecting degree of ionization. Ostwald's dilution law, pH, buffer. Numerical problems

Water and corrosion : Sources, Impurities, Hardness & it's different units, Degree of Hardness, Softening of water by Zeolite and Ion exchange method, Boiler trouble causes (Sludge and Scale), Characteristics of municipal water & its treatment, Chemical and Electrochemical corrosion, Factors affecting the rate of corrosion, General method of corrosionprevention

Module 2

Periodic Properties and Chemical Bonding:

Periodic properties: Brief introduction to Periodic table, Ionization energy, electron affinity, electro negativity, electronicconfigurations, atomic and ionic sizes, polarizability

Chemical Bonding: VSEPR theory, oxidation states, coordination numbers and geometries, hard soft acids and bases, Crystal field theory, colour & magnetic properties of coordination complexes. Types of bonds-Ionic bond, Covalent bonds,Metallic Bonds, Hydrogen bond, etc.

Module 3

Spectroscopy and Photochemistry

Spectroscopy: Principles of spectroscopy and selection rules, Electronic spectroscopy-Absorption and emission Spectroscopy, Principles and applications of UV-Visible, Factors influencing for UV-vis spectrum; Rotational and Vibrational spectroscopy, Principle of FT-IR, and NMR spectroscopy. Modern techniques in structural elucidation of compounds by UV-Vis, IR, & NMR Spectroscopy.

Photochemistry: Photochemical reaction, Lambert-Beers Law, Fluorescence and Phosphoresence, Jablonskii diagram,Einstein photochemical reaction

Module 4

Thermochemistry and Fuels

Thermochemistry: Free energy, entropy, Enthaply, EMF. Hess's law, entropy, enthalpy and combustion calculations, Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria.

Fuels: Classification of the fuel and its characteristics, Calorific value, HCV, LCV, Determination of calorific value by Bomb calorimeter, application of fossil fuels, solid fuels (coal), liquid fuels (petrol and diesel), gaseous fuels (water gas, producer gas, coal gas and biogas), carbonization and gasification, refining, reforming, , knocking and anti knocking properties, octane and cetane numbers

Module 5

Polymerization and Common Organic Reactions

Polymers: Introduction, Types, classification and properties of polymers, Different methods of synthesis- Addition, condensation. Molecular weights of polymers (M_n, M_w, M_v), glass transition temperature (Tg), synthesis of commercially important polymers and their uses (Nylon 6, Nylon 6,6, Polyethyelene, PET, PS, PVC), an introduction to green chemistry. and,

Synthesis of commercially important polymers and their uses- PVC, Teflon, Nylon 6, Nylon 66, Decoran, Vulcanization of Rubber.

Organic reactions: Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings with examples.

Course Outcomes:

1. Students will have a firm foundation in the fundamental and application of current chemical and scientific theories including those analytical, Inorganic, Organic, and Physical Chemistries. Major to be certified by the American chemical Society will have extensive laboratory work and knowledge of biological chem.
2. Students will be able to design and carry out scientific experiments as well as accurately record, and analyze the results of such experiments.
3. Students will have able to explore new areas of research in both chemistry and allied fields of science and technology.
4. Students will able to explain why chemistry is an integral activity for addressing social, economic and environmental problems

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R.K.D.F. UNIVERSITY, RANCHI

BTECH Semester-I

(Common to all Branches)

Course	Subject Title	Subject Code
B.Tech.	**Engineering Chemistry Lab**	**BT151**

List of Experiments:

1. Determination of Total hardness by EDTA method.
2. Determination of mixed alkalinity

- OH^- & $CO3^{2-}$
- $CO3^{2-}$ & $HCO3^-$

3. Determination of Flash & Fire Points by Pensky Marten Apparatus.
4. Determination of Flash & Fire Points by by Abel's Apparatus.
5. Determination of Flash & Fire Points by Cleveland's Open Cup Apparatus.
6. Determination of Calorific Value by Bomb Calorimeter.
7. Determination of Viscosity and Viscosity index by Redwood viscometer No.1.
8. Determination of Viscosity and Viscosity index by Redwood viscometer No.2.
9. Determination of percentage of carbon by Proximate analysis of coal
10. To Determine the Strength of NaOH Solution (Standard Oxalic Acid Solution Supplied)
11. To Determine the Strength of HCl Solution (Standard NaOH Solution Supplied)
12. Salt analysis: Dry Test &Wet Test acid and basic radicals

Books Suggested:

1. Chemistry in Engineering and Technology - Vol.1 & 2 Kuriacose and Rajaram, McGraw Hill Education
2. Fundamental of Molecular Spectroscopy C.N. Banwell , McGraw Hill Education
3. Engineering Chemistry – B.K. Sharma, Krishna Prakashan Media (P) Ltd., Meerut.
4. Basics of Engineering Chemistry – S.S. Dara & A.K. Singh, S. Chand &Company Ltd., Delhi.
5. Applied Chemistry – Theory and Practice, O.P. Viramani, A.K. Narula, New Age International Pvt.Ltd. Publishers, New Delhi.
6. Elementary Spectroscopy ,Y .R. Sharma , S. Chand Publishing
7. Polymer Science, Vasant R. Gowariker, N. V. Viswanathan, Jayadev Sreedhar, New Age International Pvt. Ltd
8. Advanced Inorganic Chemistry, G.R. Chatwal, Goal Publishing house
9. Engineering Chemistry (NPTEL Web-book) B.L. Tembe, Kamaluddin and M.S. Krishna
10. Engineering Chemistry Jain & Jain Dhanpat Rai and Sons

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BTECH Semester-I

(Common to all Branches)

Branch	Subject Title	Subject Code
B.Tech (Common)	Engineering Mathematics-I	BT102

Module 1

Calculus: Successive Differentiation, Rolle's theorem, Mean Value theorems, Expansion of functions by Mc. Laurin's and Taylor's for one variable; Taylor's theorem for function of two variables, Partial Differentiation, Maxima & Minima (two and three variables), Method of Lagranges Multipliers.

Module 2

Calculus: Definite Integral as a limit of a sum and Its application in summation of series; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions. Multiple Integral, Change the order of the integration, Applications of multiple integral for calculating area and volumes of the curves.

Module 3

Sequences and series: Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

Module 4

Matrices: Rank of a Matrix, Solution of Simultaneous Linear Equations by Elementary Transformation, Consistency of Equation, Eigen Values and Eigen Vectors, Diagonalization of Matrices, Cayley-Hamilton theorem andits applications to find inverse.

Module 5

Boolean Algebra: Algebra of Logic, Boolean Algebra, Principle of Duality, Basic Theorems, Boolean Expressions and Functions. Elementary Concept of Fuzzy Logic Graph Theory:

Graphs, Subgraphs, Degree and Distance, Tree, cycles and Network.

References:

1. 1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010.
5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

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B.Tech. (Common For All Branches)

New Scheme Based On AICTE Flexible Curricula

Semester – I

Course Content

Branch	Subject Title	Subject Code
B.Tech (Common)	**Technical Communication**	**BT103**

Module I

Identifying Common errors in writing: Articles, Subject-Verb Agreement, Prepositions, Active and Passive Voice,Reported Speech: Direct and Indirect, Sentence Structure.

Module II

Vocabulary building and Comprehension: Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives, synonyms, antonyms, Reading comprehension, Paragraph writing, Unseen passage.

Module III

Communication: Introduction, Meaning and Significance, Process of Communication, Oral and Written Communication, 7 c's of Communication, Barriers to Communication and Ways to overcome them, Importance of Communication for Technical students, nonverbal communication, Types and forms of Communication, Skills of Communication.

Module IV

Developing Writing Skills: Planning, Drafting and Editing, Precise Writing, Précis, Technical definition and Technical description. Report Writing: Features of writing a good Report, Structure of a Formal Report, Report of Trouble, Laboratory Report, Progress Report, Note making.

Module V

Business Correspondence: Importance of Business Letters, Parts and Layout; Application, Contents of good Resume, guidelines for writing Resume, Calling/ Sending Quotation, Order, Complaint, E-mail and Tender.

Books Recommended:

1. 'Technical Communication : Principles and practice', Meenakshi Raman and Sangeeta Sharma (Oxford)
2. 'Effective Business Communication', Krizan and merrier (Cengage learning)
3. 'Communication Skill, Sanjay Kumar and Pushlata, OUP2011
4. "Practical English Usage Michael Swan OUP, 1995.
5. "Exercises in spoken English Parts I-III CIEFL, Hyderabad, Oxford University Press
6. On writing well, William Zinsser, Harper Resource Book 2001.
7. Remedial English Grammar, F.T. Wood, Macmillan 2007.

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B.Tech. (Common For All Branches)

New Scheme Based On AICTE Flexible Curricula

Semester – I

Course Content

Branch	Subject Title	Subject Code
B.Tech. Common	**Basic Electrical & Electronics Engineering**	**BT104**

Course Objectives:

1. To make students familiar with basics of AC and DC Circuits and networks
2. To understand the construction and working principles of basic Transformer and Rotating machines
3. To understand the wiring system and Power distribution channel
4. To Design and analyze various electronic circuits

Module I

AC & DC CIRCUITS

Circuit parameters, Ohms law, Kirchhoff's law. Average and RMS values, concept of phasor representation. RLC series circuits and series resonance, RLC parallel circuits (includes simple problems in DC & AC circuits) Introduction to three phase systems – types of connections, relationship between line and phase values. (qualitative treatment only) Voltage and current sources, dependent and independent sources, source conversion, DC circuits analysis using mesh & nodal method, star-delta transformation. 1-phase AC circuits under sinusoidal steady state, active, reactive and apparent power, physical meaning of reactive power, power factor, 3-phase balanced and unbalanced supply, star and delta connections.

Module II

TRANSFORMERS

Review of laws of electromagnetism, mmf, flux, and their relation, analysis of magnetic circuits. Single-phase transformer, basic concepts and construction features, voltage, current

and impedance transformation, equivalent circuits, phasor diagram, voltage regulation, losses and efficiency, OC and SC test.

Module III

ROTATING ELECTRIC MACHINES-

Constructional details of DC machine, induction machine and synchronous machine, Working principle of DC machines, classification of DC machine, EMF equation, armature reaction, characteristic of separately excited and self excited generator. Working principle of DC motor, Importance of back EMF, Starting of DC motor, speed torque characteristic of separately excited and self excited DC motor.

Module IV

WIRING & LIGHTING

Types of wiring, wiring accessories, staircase & corridor wiring, Working and characteristics of incandescent, fluorescent, SV & MV lamps. Basic principles of earthling, simple layout of generation, transmission & distribution of power.

Module V

ELECTRONICS

Binary Number system binary addition, subtraction, multiplication and division, subtraction operation using 1's and 2's complement forms, Octal number system, hexadecimal number system conversion of number system from one number system to another number system, types of Resistor, Inductor and capacitor, color coding of resistor and capacitor P-type and N-type semiconductor, semiconductor diode its operation in forward and reverse bias, V-1 characteristics, half wave and full wave rectification, application.

Course Outcomes:

After studying this course students will be able to

1. Design various AC and DC Circuits
2. Able to explain the various parts of electrical Machines and their functioning.
3. will be able to explain wiring and power distribution.
4. Will be able to design basic electronic circuits such as diode rectifiers etc.

References:

- Basic Electrical & Electronics Engineering by V.N. Mittle & Arvind Mittle.
- Vincent Del Toro, Electrical Engineering Fundamentals, PHI Learning, II Edition
- S.Ghosh, Fundamentals of Electrical and Electronics Engineering, PHI, II Edition.
- Millman, Halkias & Parikh, Integrated Electronics, Mc Graw Hill, II Edition
- Nagrath & Kothari, Basic Electrical Engineering, TMH.
- J.S. Katre, Basic Electronics Engg, Max Pub. Pune.
- Hughes, Electrical and Electronic Technology, Pearson Education IX Edition

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Branch	Subject Title	Subject Code
B.Tech. Common	Basic Electrical & Electronics Engineering Lab	BT154

Objectives:

1. To enable students to design the DC and AC circuits practically.
2. To enable students to make electrical connections of Transformer and perform various tests on it
3. To enable students to design various electronic circuits like PN Junction, Rectifiers et

List of Experiments:

1. To verify Ohm's Law
2. To verify KCL and KVL
3. To perform Open circuit and short circuit test on Single phase transformer.
4. To analyze ratio and polarity test on single phase transformer.
5. To Design various logic gates on breadboard and virtually on software.
6. To study the Pin configuration of various logic gate ICS.
7. To study V-I Characteristics of PN Junction Diode.
8. To design half and full wave rectifiers.
9. To study the construction of DC Motors.
10. To study the construction of Transformer.

Laboratory Outcomes:

The students are expected to

1. Get an exposure to common electrical components and their ratings.
2. Make electrical connections by wires of appropriate ratings.
3. Understand the usage of common electrical measuring instruments.
4. Understand the basic characteristics of transformers and electrical machines.
5. Get an exposure to the working of basic electronic circuits.

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B.Tech. (Common For All Branches)

New Scheme Based On AICTE Flexible Curricula

Semester – I

Course Content

Branch	Subject Title	Subject Code
B.Tech. Common	**Engineering Graphics & Design**	**BT105**

Module - I

GEOMETRICAL CONSTRUCTION, USE OF INSTRUMENTS, SCALES: Representative factor, plain scales, diagonal scales, scale of chords. engineering curves; Construction of ellipse, parabola, hyperbola, Cycloid, Epi-cycloid, Hypo-cycloid, Involutes, Archimedean and logarithmic spirals.

Module II

Projections of points, lines, planes and solids. Section of Solids: Section of right solids by normal and inclined planes.

Module III

Development of Surfaces: Parallel line and radial - line method for right solids.

Isometric Projections: Isometric scale, Isometric axes, Isometric Projection from orthographic drawing.

Intersection of cylinders.

Module IV

Computer Graphics: Introduction to general purpose graphics software, plotting techniques, coordinate system transformations, line drawing, polygon an circle generation. Drawing entity commands of Computer drafting. Sectional and dimensional drawing using computer.

Module V

Working in sketcher environment, Drawing sketch, line, circle, rectangle, ellipse, arc, spline etc. Deleting & trimming sketching entities, Dimensioning the sketches ,Modifying dimension of sketches, Modifying dimension of sketches, Creating text, Transformation of sketch entiies-

mirror, scale, rotate, Drawing views, Determining visible area of the view ,Creating a cross-section views, Modifying cross-section views, Editing cross-section views, Modify the drawing views, Dimensioning & detailing the drawing views.

Text/Reference Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
5. (Corresponding set of) CAD Software Theory and User Manuals

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B.Tech. (Common For All Branches)

New Scheme Based On AICTE Flexible Curricula

Semester – II

Course Content

Branch	Subject Title	Subject Code
B.Tech. Common	**Universal Human value (UHV)-2**	**BT106**

Module 1

Introduction to Value Education

Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)

Lecture 2: Understanding Value Education

Lecture 3: Self-exploration as the Process for Value Education

Lecture 4: Continuous Happiness and Prosperity – the Basic Human Aspirations

Lecture 5: Happiness and Prosperity – Current Scenario

Lecture 6: Method to Fulfill the Basic Human AspirationsPractical

Tutorial 1: **Practice Session PS1** Sharing about Oneself

Tutorial 2: Practice Session PS2 Exploring Human Consciousness

Tutorial 3: Practice Session PS3 Exploring Natural Acceptance

Module 2

Harmony in the Human Being

Lecture 7: Understanding Human being as the Co-existence of the Self and the Body

Lecture 8: Distinguishing between the Needs of the Self and the Body

Lecture 9: The Body as an Instrument of the Self

Lecture 10: Understanding Harmony in the Self

Lecture 11: Harmony of the Self with the Body

Lecture 12: Programme to ensure self-regulation and HealthPractical

Tutorial 4: Practice Session PS4 Exploring the difference of Needs of Self and Body

Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the Self

Tutorial 6: Practice Session PS6 Exploring Harmony of Self with the Body

Module 3

Harmony in the Family and Society

Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction

Lecture 14: 'Trust' – the Foundational Value in Relationship

Lecture 15: 'Respect' – as the Right Evaluation

Lecture 16: Other Feelings, Justice in Human-to-Human Relationship

Lecture 17: Understanding Harmony in the Society **Lecture 18:** Vision for the Universal Human OrderPractical

Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust

Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect

Tutorial 9: Practice Session PS9 Exploring Systems to fulfil Human Goal

Module 4

Harmony in the Nature/Existence

Lecture 19: Understanding Harmony in the Nature

Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature

Lecture 21: Realizing Existence as Co-existence at All Levels

Lecture 22: The Holistic Perception of Harmony in ExistencePractical

Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature

Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence

Module 5

Implications of the Holistic Understanding – a Look at Professional Ethics

Lecture 23: Natural Acceptance of Human Values

Lecture 24: Definitiveness of (Ethical) Human Conduct

Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order

Lecture 26: Competence in Professional Ethics

Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies

Lecture 28: Strategies for Transition towards Value-based Life and ProfessionPractical

Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct

Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education

Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

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B.Tech. (Common For All Branches)

New Scheme Based On AICTE Flexible Curricula

Semester – I

Course Content

Branch	Subject Title	Subject Code
B.Tech. Common	**Workshop Practice**	**BT157**

Course Objectives:

This course enables the students to:

1. Familiarize with the basic manufacturing processes.
2. Impart knowledge and skill to use tools, machines, equipment, and measuring instruments.
3. Practice on manufacturing of components using workshop trades.
4. Educate students of safe handling of machines and tools.
5. Exercise individual as well as group activity with hands-on training in different workshop trades

Course Outcomes:

At the end of the course, a student should be able to:

1. Be conversant with the basic manufacturing processes.
2. Identify and apply suitable tools and instruments for machining, welding, fitting, carpentry, foundry and forging.
3. Manufacture different components using various workshop trades.
4. Take safety and precautionary measures of self and machines during operations.
5. Develop skills to work as an individual or in a team during trade practices.

LIST OF EXPERIMENT:

MACHINE SHOP

EXPERIMENT – I: Lathe Machine

Objective: To study lathe machine and to machine a given job on lathe machine as per drawing.

EXPERIMENT-II: Shaper Machine

Objective: To study Shaper machine and to machine a given job on shape

CARPENTRY SHOP

EXPERIMENT-I: Carpentry Tools and Instruments

Objective: To study the various tools, instruments and equipment used in carpentry practice as per drawing.

EXPERIMENT-II: Carpentry Practice

Objective: To perform the carpentry work by making a wooden job using different tools.

FITTING SHOP

EXPERIMENT-I: Fitting Tools and Measuring Instruments

Objective: To study the various tools used in fitting shop and perform fitting operations (like marking,chipping, hack-sawing, filing, drilling etc.)

EXPERIMENT-II: Fitting Assembly Practice

Objective: To make a job clamping plate by fitting operations and to check for its assembly with a given component.

FORGING SHOP

EXPERIMENT-I: Forging Tools

Objective: To study different tools and equipment used in hand forging practice.

FOUNDRY SHOP

EXPERIMENT-I: To study different tools and equipment used in foundry shop.

WELDING SHOP

EXPERIMENT-I: Manual Metal Arc Welding

Objective: To study arc welding processes including arc welding machines (AC & DC), electrodes and equipment. To joint two pieces of given metal by arc welding process.

EXPERIMENT-II: Gas Welding

Objective: To study gas welding processes including types of flames produced, filler metals and fluxes etc.To joint two pieces of given metal by gas welding process.

Books recommended:

Text books

1. S K Hajra Choudhury, A K. Hajra, “Elements of Workshop Technology: Vol- I and Vol -II”, MediaPromotors Pvt Ltd.

2. B S Raghuwanshi, "A course in Workshop Technology", Dhanpat Rai Publications.

Reference book

1. P.N. Rao, “Manufacturing Technology Vol-1and Vol-II”, Tata McGraw Hill.

2. Kalpakjian, "Manufacturing Engineering and Technology", Pearson.

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B.Tech. (Common For All Branches)

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Semester – II

Course Content

Branch	Subject Title	Subject Code
B.Tech. Common	**Engineering Physics**	**BT201**

Module-I

Wave Optics

Interference: Fresnel's biprism, Interference in thin films, Newton's rings and Michelson's interferometer experiments. Diffraction at single slit, double slit and n-slit. Diffraction grating. Rayleigh criterion, resolving power of a telescope, grating and prism. Concept of polarized light, Brewster's laws, Double refraction, Nicol prism, quarter & half wave plate. Idea about circularly & elliptically polarized light.

Module-II

Nuclear Physics

Nuclear Structure & Nuclear properties, Quantitative treatment of nuclear models: liquid drop and shell models, Linear Particle accelerator, Cyclotron, Synchrotron, Synchrocyclotron, and Betatron, Nuclear cross section, chain reaction, critical size. Application of E = mc2 ,Q-Value, Nuclear fusion & fission, Nuclear reactors, Geiger- Muller Counter, Bainbridge and Auston mass Spectrograph.

Module-III

Semiconductors & Nano-Physics

Free Electron model of solids, Qualitative Analysis of Kronig Penny model ,Effective mass, Fermi level for Intrinsic and Extrinsic Semiconductors: p-n junctions, Zener break down, photodiode, solar-cells, Hall effect. Elementary idea about Nano structures and Nano materials.

Module-IV

Laser and Fiber Optics

Laser: Stimulated and spontaneous emission, Einstein's A & B Coefficients, transition

probabilities, active medium, population inversion, pumping, Optical resonators, characteristics of laser beam. Coherence, directionality and divergence. Principles and working of Ruby, Nd:YAG, He-Ne & Carbon dioxide Lasers with energy level diagram.. Fundamental idea about optical fiber, types of fibers, acceptance angle & cone, numerical aperture, V-number, propagation of light through step index fiber (Ray theory) pulse dispersion, attenuation, losses & various uses. Engineering uses & applications of laser and Optical Fiber

Module-V

Quantum Physics

Origin of Quantum hypothesis, DeBroglie's hypothesis of matter wave & its experimental verification. Group and particle velocities & their relations. Uncertainty principle with elementary proof & its application to Electron microscope, Compton effect. Wave function and its physical significance, general idea and application of time dependent and time independent Schrodinger wave equation.

List of suggestive core experiments: -

1. Biprism, Newton's Rings, Michelsons Interferometer.
2. Resolving Powers –Telescope, Microscope, and Grating.
3. G.M. Counter
4. Spectrometers-R.I., Wavelength, using prism and grating
5. Optical polarization based experiments: Brewster's angle, polarimeter etc.
6. Measurements by LASER-Directionality, Numerical aperture, Distance etc.
7. Uses of Potentiometers and Bridges (Electrical)..
8. Experiments connected with diodes and transistor.
9. Measurement of energy band gap of semiconductor.
10. Other conceptual experiments related to theory syllabus.

Reference Books: -

1.Engineering Physics- V. S. Yadava, TMH

2.A T.B. of Optics by Brijlal and Subhraininyan.

3.Optics By Ghatak, TMH

4.Engineering physics by M.N. Avadhanulu and P.G. Kshirsagar. S. Chand & Co.

5.Fundamentals of engineering physics by P. Swarup, Laxmi Publications.

6.Atomic and Nuclear physics by Brijlal and Subraminiyan.

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B.Tech. (Common For All Branches)

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Semester – II

Course Content

Branch	Subject Title	Subject Code
B.Tech. Common	**Engineering Mathematics-II**	**BT202**

Module 1

Ordinary Differential Equations I : Differential Equations of First Order and First Degree (Leibnitz linear, Bernoulli's, Exact), Differential Equations of First Order and Higher Degree, Higher order differential equations with constants coefficients, Homogeneous Linear Differential equations, Simultaneous Differential Equations.

Module 2

Ordinary differential Equations II: Second order linear differential equations with variable coefficients, Method of variation of parameters, Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

Module 3

Partial Differential Equations: Formulation of Partial Differential equations, Linear and Non-Linear Partial Differential Equations, Homogeneous Linear Partial Differential Equations with Constants Coefficients.

Module 4

Vector Calculus: Differentiation of Vectors, Scalar and vector point function, Gradient, Geometrical meaning of gradient, Directional Derivative, Divergence and Curl, Line Integral, Surface Integral and Volume Integral, Gauss Divergence, Stokes and Green theorems.

Module 5

Functions of Complex Variable: Functions of Complex Variables: Analytic Functions, Harmonic Conjugate, Cauchy-Riemann Equations (without proof), Line Integral, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Singular Points,

Poles & Residues, Residue Theorem, Application of Residues theorem for Evaluation of Real Integral (Unit Circle).

Textbooks/References:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9thEdn., Wiley India, 2009.
4. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
5. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
6. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
7. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., McGraw Hill, 2004.
8. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
9. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

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BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

BTECH Semester-II

(Common to all Branches)

Course Content

Branch	Subject Title	Subject Code
B.Tech. Common	Basic Mechanical Engineering	BT203

Module-I

Materials: Classification of engineering material, Composition of Cast iron and Carbon steels, Iron Carbon diagram. Alloy steels their applications. Mechanical properties like strength, hardness, toughness, ductility, brittleness, malleability etc. of materials, tensile test- Stress-strain diagram of ductile and brittle materials**, Hooks law and modulus of elasticity, Hardness and Impact testing of materials, BHN etc.**

Module-II

Measurement: Concept of measurements, errors in measurement, Temperature, Pressure, Velocity, Flow strain, Force and torque measurement, Vernier caliper, Micrometer, Dial gauge, Slip gauge, Sine-bar and Combination set.

Production Engineering: Elementary theoretical aspects of production processes like casting, carpentry,welding etc Introduction to Lathe and Drilling machines and their various operations.

Module-III

Fluids : Fluid properties pressure, density and viscosity etc. Types of fluids , Newton's law of viscosity , Pascal's law , Bernoulli's equation for incompressible fluids, Only working principle of Hydraulic machines, pumps, turbines, Reciprocating pumps .

Module-IV

Thermodynamics : Thermodynamic system, properties, state, process, Zeroth, First and second law of thermodynamics, thermodynamic processes at constant pressure, volume, enthalpy & entropy.

Steam Engineering : Classification and working of boilers, mountings and accessories of boilers, Efficiency and performance analysis, natural and artificial draught**,** steam properties, use of steam tables.

Module-V

Reciprocating Machines :

Working principle of steam Engine, Carnot, Otto, Diesel and Dual cycles P-V & T-S diagrams and its efficiency, working of Two stroke & Four stroke Petrol & Diesel engines. Working principle of compressor.

Reference Books:

1- Kothandaraman & Rudramoorthy, Fluid Mechanics & Machinery, New Age . 2- Nakra & Chaudhary , Instrumentation and Measurements, TMH.
2- Nag P.K, Engineering Thermodynamics , TMH . 4- Ganesan , Internal Combustion Engines, TMH .
3- Agrawal C M, Basic Mechanical Engineering ,Wiley Publication. 6- Achuthan M , , Engineering Thermodynamics ,PHI.

List of Suggestive Core Experiments:

Theory related Eight to Ten experiments including core experiments as follows:-

1. Study of Universal Testing machines.
2. Linear and Angular measurement using, Micrometer, Slip Gauges, Dial Gauge and Sine-bar.
3. Study of Lathe Machine.
4. Study of Drilling Machines.
5. Verification of Bernoulli's Theorem.
6. Study of various types of Boilers.
7. Study of different IC Engines.
8. Study of different types of Boiler Mountings and accessories.

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BTECH Semester-II

(Common to all Branches)

Course Content

Branch	Subject Title	Subject Code
B.Tech. Common	**Basic Civil Engineering & Engineering Mechanics**	**BT204**

Module-I

Building Materials & Construction

Stones, bricks, cement, lime, timber-types, properties, test & uses, laboratory tests concrete and mortar Materials: Workability, Strength properties of Concrete, Nominal proportion of Concrete preparation of concrete, compaction, curing, Low cost housing building materials.

Elements of Building Construction, Foundations conventional spread footings, RCC footings, brick masonry walls, plastering and pointing, floors, roofs, Doors, windows, lintels, staircases – types and their suitability

Module-II

Surveying & Positioning:

Introduction to surveying Instruments – levels, thedolites, plane tables and related devices. Electronic surveying instruments etc. Measurement of distances – conventional and EDM methods, measurement of directions by different methods, measurement of elevations by Different methods and different methods of leveling.

Module-III

Mapping & Sensing:

Mapping details and contouring, Profile Cross sectioning and measurement of areas, volumes, application of measurements in quantity computations, Survey stations, Introduction of remote sensing, GIS and GPS and its applications.

Engineering Mechanics

Module-IV

Forces and Equilibrium: Graphical and Analytical Treatment of Concurrent and nonconcurring Co- planner forces, free Diagram, Force Diagram and Bow's notations, Application of Equilibrium Concepts: Analysis of plane Trusses: Method of joints, Method of Sections. Frictional force in equilibrium problems

Module-V

Centre of Gravity and moment of Inertia: Centroid and Centre of Gravity, Moment Inertia of Area and Mass,Radius of Gyration, Introduction to product of Inertia and Principle Axes.

Support Reactions, Shear force and bending moment Diagram for Cantilever & simply supported beam with concentrated, distributed load and Couple.

Reference Books:

1. S. Ramamrutam & R.Narayanan; Basic Civil Engineering, Dhanpat Rai Pub.
2. Prasad I.B., Applied Mechanics, Khanna Publication.
3. Punmia, B.C., Surveying, Standard book depot.
4. Shesha Prakash and Mogaveer; Elements of Civil Engg & Engg. Mechanics; PHI
5. S.P,Timoshenko, Mechanics of stricture, East West press Pvt.Ltd.
6. Surveying by Duggal – Tata McGraw Hill New Delhi.
7. Introduction to GIS by Chang
8. Surveying and Leveling by N.M. Basak, McGraw Hill

List of suggestive core Experiments:

Students are expected to perform minimum ten experiments from the list suggested below by preferablyselecting experiments from each module of syllabus.

S. No.	Title
1.	To perform traverse surveying with prismatic compass, check for local attraction and determine correctedbearings and to balance the traverse by Bowditch's rule.
2.	To perform leveling exercise by height of instrument of Rise and fall method.
3.	To measure horizontal and vertical angles in the field by using Theodolite.

4. To determine (a) normal consistency (b) Initial and Final Setting time of a cement Sample.
5. To determine the workability of fresh concrete of given proportions by slump test or compaction factor test.
6. To determine the Compressive Strength of brick.
7. To determine particle size distribution and fineness modulus of course and fine Aggregate.
8. To verify the law of Triangle of forces and Lami's theorem.
9. To verify the law of parallelogram of forces.
10. To verify law of polygon of forces

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Semester – II

Course Content

Branch	Subject Title	Subject Code
B.Tech. Common	**Programming for Problem Solving With C**	**BT205**

Module-I

INTRODUCTION OF COMPUTERS: Computer System, System Characteristics and capabilities, Types of Computers: Analog, Digital (Micro, Mini, Mainframe & Super Computers), Generation of Computers.

COMPUTER ORGANISATION: Block Diagram of Computer and its functional units.

Module-II

INPUT DEVICES: KeyBoard, Scanner, Mouse, Light Pen, Bar Code Reader, OMR, OCR, MICR., Track ball, Joystick, Touch Screen etc.

OUTPUT DEVICES: Monitors – Classification of Monitors based on Technology (CRT Monitor & Flat panel LCD Monitor), Printers – Dot Matrix Printer, Ink Jet Printer, Laser Printer and Plotters, Types of Plotters – DrumPlotter and Flat Bed Plotters, LCD Projectors.

STORAGE DEVICES: Magnetic tapes, Floppy Disks, Hard Disks, Compact Disc – CD-ROM, CD-RW, VCD,DVD, DVD-RW.

PROGRAMMING LANGUAGES: History, Classifications – Low Level, Assembly & High Level languages, Advantages & Disadvantages Programming Languages.

Module-III

INTRODUCTION TO PROGRAMMING: Idea of Algorithm: steps to solve logical and numerical problems.Representation of Algorithm: Flowchart/Pseudocode with examples.

From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax andLogical Errors in compilation, object and executable code.

Module-IV

Arithmetic expressions and precedence, Conditional Branching and Loops, Writing and evaluation of conditionals and consequent branching, Iteration and loops.

PROGRAM PLANNING: Purpose of Program Planning, Steps in Program Development, Characteristics of aGood Program, Algorithms, Flow Charts through examples.

Module-V

TYPES OF SOFTWARE: System Software – Translators (Compilers, Interpreters, Assemblers), Operating System, Linkers, Libraries & Utilities, Application Software – Packaged & Tailored Softwares.

OPERATING SYSTEMS: Introduction, Types of O.S. – Single User, Multi User – Multi Programming, Multi Tasking, Real Time, Time Sharing, Batch Processing, Parallel Processing, Distributed Processing.

TEXT BOOK:

1. COMPUTER FUNDAMENTALS BY *P.K. SINHA*
2. OPERATING SYSTEM BY *Peterson*
3. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
4. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

Reference Books:

1. EASY APPROACH TO COMPUTER COURSE BY *G.K. IYER*
2. COMPUTER TODAY BY *S.K. BASANDRA*
3. OPERATING SYSTEM BY *Godbole*
4. 'O' LEVEL PROGRAMMING CONCEPTS & SYSTEMS BY *V.K. JAIN*
5. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

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B.Tech. (Common For All Branches)

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Semester – II

Course Content

Branch	Subject Title	Subject Code
B.Tech. Common	**Language Laboratory**	**BT206**

Communicative Language Laboratory: Course objective: The language laboratory focuses on the practice of English through audio-visual aids and Computer software. It intends to enable the students to speak English correctly with confidence and intends to help them to overcome their inhibitions and self –consciousness while speaking in English.

Topics to be covered in the Language laboratory sessions:

1. Listening Comprehension
2. Pronunciation, Intonation, Rhythm
3. Practicing everyday dialogues in English
4. Interviews
5. Formal Presentation
6. Public Speaking and oral skills with emphasis on conversational practice, extempore speech, JAM (Just a minute sessions), describing objects and situations, giving directions, debate, telephonic etiquette.

Suggested Readings:

(i) Practical English Usage. Michael Swan. OUP. 1995.

(ii) Remedial English Grammar. F.T. Wood. Macmillan.2007

(iii) On Writing Well. William Zinsser. Harper Resource Book. 2001

(iv) Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.

(v) Communication Skills. Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.

(vi) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

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B.Tech. (Common for All Branches)

New Scheme Based On AICTE Flexible Curricula

Semester – II

Course Content

Branch	Subject Title	Subject Code
B.Tech. Common	**Sports and Yoga /NSS**	**BT257**

Course Objective(s):

- To make the students understand the importance of sound health and fitness principles as they relate to better health.
- To expose the students to a variety of physical and yogic activities aimed at stimulating their continued inquiry aboutYoga, physical education, health and fitness.
- To create a safe, progressive, methodical and efficient activity based plan to enhance improvement and minimize risk ofinjury.
- To develop among students an appreciation of physical activity as a lifetime pursuit and a means to better health.

Course Contents:

Module I

Introduction to Physical Education

- Meaning & definition of Physical Education
- Aims & Objectives of Physical Education
- Changing trends in Physical Education

Module II

Olympic Movement

- Ancient & Modern Olympics (Summer & Winter)
- Olympic Symbols, Ideals, Objectives & Values

- Awards and Honours in the field of Sports in India (Dronacharya Award, Arjuna Award, Dhayanchand Award, RajivGandhi Khel Ratna Award etc.)

Module III

Physical Fitness, Wellness & Lifestyle

- Meaning & Importance of Physical Fitness & Wellness
- Components of Physical fitness
- Components of Health related fitness
- Components of wellness
- Preventing Health Threats through Lifestyle Change
- Concept of Positive Lifestyle

Module IV

Fundamentals of Anatomy & Physiology in Physical Education, Sports and Yoga

- Define Anatomy, Physiology & Its Importance
- Effect of exercise on the functioning of Various Body Systems. (Circulatory System, Respiratory System, Neuro-Muscular System etc.)

Module V

Kinesiology, Biomechanics & Sports

- Meaning & Importance of Kinesiology & Biomechanics in Physical Edu. & Sports
- Newton's Law of Motion & its application in sports.
- Friction and its effects in Sports.

Practicals

1. To practice Physical activities and Hatha Yoga focusing on yoga for strength, flexibility, and relaxation.
2. To learn techniques for increasing concentration and decreasing anxiety which leads to stronger academic performance.
3. To learn breathing exercises and healthy fitness activities
4. To understand basic skills associated with yoga and physical activities including strength and flexibility, balance and coordination.

5. To perform yoga movements in various combination and forms.
6. To assess current personal fitness levels.
7. To identify opport Moduleies for participation in yoga and sports activities.
8. To develop understanding of health-related fitness components: cardiorespiratory endurance, flexibility and bodycomposition etc.
9. To improve personal fitness through participation in sports and yogic activities.
10. To develop understanding of psychological problems associated with the age and lifestyle.
11. To demonstrate an understanding of sound nutritional practices as related to health and physical performance.
12. To assess yoga activities in terms of fitness value.
13. To identify and apply injury prevention principles related to yoga and physical fitness activities.

Text Books/References:

1. Modern Trends and Physical Education by Prof. Ajmer Singh.
2. Light On Yoga by B.K.S. Iyengar.
3. Health and Physical Education – NCERT (11th and 12th Classes)

B.Tech. (Mechanical Engineering)

Semester – III

Branch	Subject Title	Subject Code
B.Tech. ME	Engineering Mathematics-III	BT- 301

Module-I

Fourier series: Introduction of Fourier series, Fourier series for Discontinuous functions, and Fourier series for even and odd function. Laplace Transform: Introduction of Laplace Transform, Laplace Transform of elementary functions, properties of Laplace Transform, Change of scale property, second shifting property, Laplace transform of the derivative, Inverse Laplace transform & its properties, Convolution theorem, Applications of L.T. to solve the ordinary differential equations.

Module-II

Difference Operators, Interpolation (Newton Forward & Backward Formulae, Central Interpolation Formulae, Lagrange's and divided difference formulae), Numerical Differentiation and Numerical Integration.

Module-III

Errors & Approximations, Solution of Algebraic & Trancedental Equations (Regula Falsi, Newton-Raphson, Iterative, Secant Method), Solution of simultaneous linear equations by Gauss Elimination, Gauss Jordan, Crout's methods , Jacobi's and Gauss-Siedel Iterative methods.

Module-IV

Solution of Ordinary Differential Equations (Taylor's Series, Picard's Method, Modified Euler's Method, Runge-Kutta Method, Milne's Predictor & Corrector method), Correlation and Regression, Curve Fitting (Method of Least Square).

Module-V

Concept of Probability: Probability: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Testing of Hypothesis |: Students t-test, Fisher's z-test, Chi-Square Method.

References

1. Higher Engineering Mathematics by BS Grewal, Khanna Publication
2. Advance Engineering Mathematics by D.G.Guffy
3. Mathematics for Engineers by S.Arumungam, SCITECH Publuication
4. Engineering Mathematics by S S Sastri. P.H.I.
5. Numerical Methods for Scientific and Engg. Computation by MKJain, Iyengar and RK Jain, New Age International Publication
6. Mathematical Methods by KV Suryanarayan Rao, SCITECH Publuication
7. Pobability and Statistics by Ravichandran, Wiley India
8. Mathematical Statistics by George R., Springer

RKDF UNIVERSITY RANCHI

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

B.TECH (MECHANICAL ENGINEERING)

Semester – III

Branch	Subject Title	Subject Code
ME	**STRENGTH OF MATERIALS**	**MEP - 302**

Course Objectives:

1. To provide the basic concepts and principles of strength of materials.
2. To give an ability to calculate stresses and deformations of objects under external loadings.
3. To give an ability to apply the knowledge of strength of materials on engineering applications and design problems.

Module-I

STRESS AND STRAIN: Definition**,** Stress- strain, tensile & compressive stresses, shear stress, Elastic limit, Hooke's Law, Poission' Ratio, modulus of elasticity, modulus of rigidity, bulk modulus, yield stress, ultimate stress, factor of safety, state of simple shear, relation between elastic constants, Volumetric Strain, Volumetric strain for tri-axial loading, Deformation of tapering members, Deformation due to self weight, bars of varying sections, composite sections, temperature-stress, Mechanical properties of materials: Ductility, malleability, hardness, toughness, fatigue, creep, behavior of materials under tension, compression, bending and shear, ductile and brittle materials, failure of MS and CI in tension and torsion

Module-II

COMPOUND STRESSES: Introduction, Stress components on inclined planes, General two-dimensional stress system, Principal planes and stresses, Mohr's circle of stresses. Thin cylinders subjected to pressure, change in length, diameter and volume, Thick cylinders - Lame's equations (excluding compound cylinders).

Module-III

STRESSES IN BEAMS: Theory of pure Bending, Assumptions, Flexural formula for straight beams, moment of resistance, bending stress distribution, Section moduli for different sections, beams for uniform strength, Flitched beams, Principle axes, Principle moment of inertia, Direct & Bending Stresses: Core of Section, Chimneys subjected to wind pressure, shear stress in beams: Distribution of shear stress across plane sections used commonly for structural purposes, shear connectors.

Module-IV

BENDING : pure bending, symmetric member, deformation and stress, bending of composite sections, eccentric axial loading, shear force and BM diagram, relationship among load, shear and BM, shear stresses in beams, strain energy in bending, deflection of beams, equation of elastic curve, Macaulay's method and Area moment method for deflection of beams.

Module-V

TORSION: Torsion of circular shafts- solid and hollow, stresses in shaft when transmitting power, shafts in series and parallel. Torsion in shafts: stresses in a shaft, deformation in circular shaft, angle of twist, stepped-hollow, thin-walled hollow transmission shafts, Leaf springs; helical springs, open and closed coil, stress in spring wire, deflection of helical spring, springs in series and parallel.

Reference Books

1. Mechanics of Structures Vol. ...
2. Strength of Materials by D. ...
3. Strength of Materials by R. ...
4. Strength of Materials by S. S. Ratan, Tata McGraw Hill.
5. Elements of Strength of Materials by Timoshenko and Young, East-West Press Ltd.
6. Strength of Materials by F.

Course outcomes:

To understand the basics of material properties, stress and strain

To apply knowledge of mathematics, science, for engineering applications. Ability to identify, formulate, and solve engineering & real-life problems. Ability to design and conduct experiments, as well as to analyze andinterpret data.

RKDF UNIVERSITY RANCHI

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

B.Tech. (Mechanical Engineering)

Semester – III

Branch	Subject Title	Subject Code
ME	**MANUFACTURING PROCESSES**	**MEP - 303**

Course Objective

The main objective of this course is to emphasize the importance manufacturing sciences in the day-to-day life, and to study the basic manufacturing processes and tools used. The course is delineated particularly to understand the conventional manufacturing processes like casting, metal forming, and welding process**.**

Module-I

Patterns and Pattern making: Introduction to Foundry - Steps involved in casting, advantages, limitations and applications of casting process. Pattern types, allowances for pattern, pattern materials, color coding and storing of patterns, Moulding methods and processes-materials, equipment, Moulding sand ingredients, essential requirements, sand preparation and control, testing, cores and core making. Design considerations in casting, gating and Riser - directional solidification in castings, Metallurgical aspects of Casting

Module-II

Casting Processes: Sand castings, pressure die casting, permanent mould casting, centrifugal casting, precision investment casting, shell Moulding, CO_2 Moulding, continuous casting-squeeze casting, electro slag casting, Fettling and finishing, defects in Castings, Casting of non-ferrous materials, Melting, Pouring and Testing

Melting furnaces: crucibles oil fired furnaces-electric furnaces-cupola, selection of furnace, calculation of cupola charges-Degasification, inoculation, pouring techniques casting defects and Inspection of castings.

Module-III

Basic Joining Processes: Types of welding-gas welding, -arc welding,-shielded metal arc welding, GTAW, GMAW, SAW, ESW-Resistance welding (spot, seam, projection, percussion, flash types)-atomic hydrogen arc welding- thermit welding, Flame cutting - Use of Oxyacetylene, modern cutting processes, arc cutting,

Module-IV

Special Welding Processes: Soldering, brazing and braze welding and their application, welding of special materials – Stainless steel, Aluminium etc. weldability of cast iron, steel, stainless steel, aluminium alloys, Introduction to Electron beam and Laser welding.

Module-V

Design of Weldments: Welding symbols-Positions of welding-joint and groove design-weld stress-calculations-design of weld size, estimation of weld dilution, heat input, effect of welding parameters preheating, and post heating temperature, Selection of electrodes, flux etc. Weldments Testing and Metallurgy Inspection of welds – destructive and non-destructive testing methods, Defects in welding- causes and remedies, -effect of gases in welding-fatigue failure in Weldments.

Reference Books

1. Alting, Leo. (1982). *Manufacturing Engineering Processes.* Marcel Dekker, New York.
2. Amstead, B.H; et. al. (1987). *Manufacturing Processes.* John-Wiley and Sons, New York.
3. Armarego, E.J.A. and Brown, R.H. (1969), *Machining of Metals.* Prentice Hall, NJ.
4. Ashby, M.F; (1992). *Materials Selection in Mechanical Design.* Pergamon, New York.
5. Avitzur, B. (1983). *Handbook of Metal Forming Processes.* Wiley-Interscience, New York.
6. Black, S.C; Chites, V; and Lissman, A.J. (1966). *Principles of Engineering Manufacture*, 3rd

Edition. Arnold, London.

7. Brown, Steve. (2000). *Manufacturing the Future: Strategic Resonance for Enlightened Manufacturing.* Addison-Wesley Longman, Singapore.

8. Callister, D.C; Jr. (1991). *Materials Science and Engineering.* John ...

Course Outcomes

The student will be able to develop simplified manufacturing processes with the aim of reduction of cost and manpower. The student will be able to identify/control the appropriate process parameters, and possible defects of manufacturing processes so as to remove them.

RKDF UNIVERSITY RANCHI

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

B.Tech (Mechanical Engineering)

Semester – III

Branch	Subject Title	Subject Code
ME	**THERMODYNAMICS**	**MES - 304**

Course Objectives:

1. This course aims to provide a good platform to mechanical engineering students to understand, model and appreciate concept of dynamics involved in thermal energy transformation.

2. To prepare them to carry out experimental investigation and analysis at later stages of graduation.

Module-I

Basic concepts: Thermodynamics, Property, Equilibrium, State, Process, Cycle, Zeroth law of thermodynamics, statement and significance, concept of an Ideal gas, Gas laws, Avogadro's hypothesis, Heat and work transfer. First law of thermodynamics- Statement of first law of thermodynamics, first law applied to closed system, first law applied to a closed system undergoing a cycle, processes analysis of closed system, flow process, flow energy, steady flow process, Relations for flow processes, limitations of first law of thermodynamics.

Module-II

Second law of thermodynamics, heat engine, heat reservoir, Refrigerator, heat pump, COP, EPR, Available energy, Carnot's theorem, Carnot's cycle, efficiency of Carnot's cycle, statement of second law Reversible and irreversible processes, consequence of second law, Entropy, Entropy change for ideal gas, T- S diagrams, Availability and Irreversibility. Gibbs and Helmholtz functions

Module-III

Real gas, Deviation with ideal gas, Vander-wall's equation, evaluation of its constants, limitations of the equation. The law of corresponding states Compressibility factor, Generalized compressibility chart, P-V- T surface of a Real gas, Thermodynamics relations, Maxwell relations and their applications.

Module-IV

Pure Substance, Phase, Phase-transformations, formation of steam, properties of steam, PVT surface, HS,TS,PV,PH,TV diagram, processes of vapor measurement of dryness fraction, Use of steam table and Mollier chart.

Module-V

Air standard cycles, Carnot, Otto, Diesel, Dual cycles and there comparison, two stroke and four stroke engines, Brayton cycle, non reactive gas mixture, PVT relationship, mixture of ideal gases, properties of mixture of ideal gases, internal energy, Enthalpy and specific heat of gas mixtures, Enthalpy of gasmixtures.

Course Outcomes:

1. To apply the knowledge of mathematics, science and engineering fundamentals to model the energy conversion phenomenon.
2. To identify and formulate power production based on the fundamentals laws of thermal engineering.
3. To instill upon to envisage appropriate experiments related to heat engines.
4. To investigate the effectiveness of energy conversion process in mechanical power generation for the benefit of mankind.
5. To appreciate concepts learnt in fundamentals laws of thermodynamics from which learning ideas how to sustain in energy crisis and think beyond curriculum in the field of alternative and renewable sources of energy.

6. To communicate effectively the concepts of internal combustion engines and try to think beyond curriculum in alternative sources of energy.

References:

1. P.K.Nag; Engineering Thermodynamics; TMH
2. Van GJ; Thermodynamics; John Wylen
3. Cengel Y; Thermodynamics; TMH
4. Arora CP; Thermodynamics; TMH
5. Thermal Engineering by R Yadav
6. Engineering Thermodynamics by Omkar Singh New Age International.
7. Engineering Thermodynamics by Ratha Krishanan PHI India Pvt. Ltd.
8. Engineering Thermodynamics by M. Achuthan, PHI India.

RKDF UNIVERSITY RANCHI

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

New Scheme of Examination as Per AICTE Flexible Curricula

B.Tech. (Mechanical Engineering)

Semester-III

Branch	Subject Title	Subject Code
B.Tech. ME	OOP (Object-OrientedProgramming) with C++	**BT305**

COURSE OBJECTIVES

1. Introduce the student to the concepts of C++ in computer science.
2. Acquire knowledge to make functions , Files atc

COURSE OUTCOMES

1. Knowledge of programming language.
2. Be aware about OOP's concept.
3. Basic understanding on programming.

COURSE CONTENT

Module-I

Introduction to C++ and Object oriented Concepts C++ Standard Library, Basics of a Typical C++ Environment, Pre- processors Directives, illustrative Simple C++ Programs. Header Files and Namespaces, library files. Introduction to Objects and Object Oriented Programming, Encapsulation (Information Hiding), Access Modifiers: Controlling access to a class, method, or variable (public, protected, private,package), Other Modifiers, Polymorphism: Overloading,Inheritance, Overriding Methods, Abstract Classes, Reusability, Class's Behaviors.

Module-II

Classes and Data Abstraction:

Introduction, Structure Definitions, Accessing Members of Structures, Class Scope and accessing Class Members, Separating Interface from Implementation, Controlling Access Function And

Utility Functions, Initializing Class Objects: Constructors, Using Default Arguments With Constructors, Using Destructors, Classes : Const(Constant) Object And Const Member Functions, Object as Member of Classes, Friend Function and Friend Classes, Using This Pointer, Dynamic Memory Allocation with New and Delete, Static Class Members, Container Classes And Integrators, Proxy Classes, Function overloading.

Module-III

Operator Overloading, Inheritance, and Virtual Functions and Polymorphism: Fundamentals of Operator Overloading, Restrictions On Operators Overloading, Operator Functions as Class Members vs. as Friend Functions, Overloading, <<, >> Overloading Unary Operators, Overloading Binary Operators. Introduction to Inheritance, Base Classes And Derived Classes, Protected Members, Casting Base- Class Pointers to Derived- Class Pointers, Using Member Functions, Overriding Base – Class Members in a Derived Class, Public, Protected and Private Inheritance, Using Constructors and Destructors in derived Classes, Implicit Derived –Class Object To Base-Class Object Conversion, Composition Vs. Inheritance. Introduction to Virtual Functions, Abstract Base Classes And Concrete Classes, Polymorphism, New Classes And Dynamic Binding, Virtual Destructors, Polymorphism, Dynamic Binding.

Module-IV

Files and I/O Streams and Templates and Exception Handling:

Files and Streams, Creating a Sequential Access File, Reading Data From A Sequential Access File, Updating Sequential Access Files, Random Access Files, Creating A Random Access File, Writing Data Randomly To a Random Access File, Reading Data Sequentially from a Random Access File. Stream Input/Output Classes and Objects, Stream Output, Stream Input, Unformatted I/O (with read and write), Stream Manipulators, Stream FormatStates, Stream Error States.

Function Templates, Overloading Template Functions, Class Template, Class Templates and Non-Type Parameters, Templates and Inheritance, Templates and Friends, Templates and Static Members. Introduction, Basics of C++ Exception Handling: Try Throw, Catch, Throwing an

Exception, Catching an Exception, Rethrowing an Exception, Exception specifications, Processing Unexpected Exceptions, Stack Unwinding, Constructors, Destructors and Exception Handling, Exceptions and Inheritance.

TEXT BOOKS:

1.C++ How to Program by H M Deitel and P J Deitel, 1998, Prentice Hall

2.Object Oriented Programming in Turbo C++ by Robert Lafore, 1994, The WAITE Group Press.

3.Programming with C++ By D Ravichandran, 2003, T.M.H

REFERENCE BOOKS:

1. Object oriented Programming with C++ by E Balagurusamy, 2001, Tata McGraw-Hill 2.Computing Concepts with C++ Essentials by Horstmann, 2003, John Wiley,
2. The Complete Reference in C++ By Herbert Schildt, 2002, TMH.

RKDF UNIVERSITY RANCHI

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

New Scheme of Examination as Per AICTE Flexible Curricula

B.Tech. (Mechanical Engineering)

Branch	Subject Title	Subject Code
B.Tech (ME)	**Environmental Science**	BT306

Course Objectives:

According to UNESCO (1971), the objectives of environmental studies are:

(a) Creating the awareness about environmental problems among people.

(b) Imparting basic knowledge about the environment and its allied problems.

(c) Developing an attitude of concern for the environment.

Module-I

Introduction to environmental studies and Ecosystems

Multidisciplinary nature of environmental studies; Scope and importance; Concept of sustainability and sustainable development, ecosystem, Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession, Case studies of the following ecosystems:Forest ecosystem ,Grassland ecosystem ,Desert ecosystem Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Module-II

Natural Resources: Renewable and Non-renewable Resources

Land resources and land use change; Land degradation, soil erosion and desertification, Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations, Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state), Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

Module-III

Biodiversity and Conservation & Environmental Pollution

Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of

India; Biodiversity patterns and global biodiversity hot spots, India as a mega-biodiversity nation; Endangered and endemic species of India, Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation , Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution ,Nuclear hazards and human health risks ,Solid waste management: Control measures of urban and industrial waste ,Pollution case studies.

Module-IV

Environmental Policies- Practices and Human communities

Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture, Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD), Human population growth: Impacts on environment, human health and welfare, Resettlement and rehabilitation of project affected persons; case studies, Disaster management: floods, earthquake, cyclones and landslides. Case studies (e.g., factory pollution in Ranchi)

Reference Books

1. Blackwell's Concise Encyclopedia of Ecology by Peter Calow. ...
2. Blackwell's Concise Encyclopedia of Environmental Management by Peter Calow. ...
3. Conservation and Environmentalism by Robert C. ...
4. Encyclopedia of Biodiversity by Simon A. ...
5. Encyclopedia of Disasters by Angus M.

Course Learning Outcomes

The course will empower the undergraduate students by helping them to:

i. Gain in-depth knowledge on natural processes that sustain life, and govern economy.

ii. Predict the consequences of human actions on the web of life, global economy and quality of human life.

iii. Develop critical thinking for shaping strategies (scientific, social, economic and legal) for environmental protection and conservation of biodiversity, social equity and sustainable

development.

iv. Acquire values and attitudes towards understanding complex environmental-economic social challenges, and participating actively in solving current environmental problems and preventing the future ones.

v. Adopt sustainability as a practice in life, society and industry

RKDF UNIVERSITY RANCHI

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

New Scheme of Examination as Per AICTE Flexible Curricula

Branch	Subject Title	Subject Code
B.Tech. ME	Kinematics of Machines	MEP401

Objectives:

1. Comprehend the fundamentals of kinematics. And to understand the concept of machines, mechanisms and related terminologies.
2. Discriminate mobility (number of degrees-of-freedom). Enumeration of rigid links and types of joints within mechanisms. To make the students become familiar and understanding of the most commonly used mechanisms (4-bar, 6-bar linkages, and cams).
3. Formulate the concept of synthesis and analysis of different mechanisms. To understand the Principles and working of various straight line motion mechanisms
4. Distinguish a mechanism for displacement, velocity and acceleration at any point in a moving link this is prerequisite for dynamics of machines. To analyze Steering gear mechanisms and working of hooks joint. To understand the working principles in power drives. To understand the theory ofgears, gear trains and cams

Module-I

Introduction Links-types, Kinematics pairs-classification, Constraints-types, Degrees of freedom of planar mechanism, Grubler's equation, linkage mechanisms, inversions of four bar chain, slider crank chain and double slider crank chain Velocity in Mechanisms Velocity of point in mechanism, relative velocity method, Velocities in four bar mechanism, slider crank mechanism and quick return motion mechanism, Rubbing velocity at a pin joint, Instantaneous center method, Types & location of instantaneous centers, Kennedy's theorem, Velocities in four bar mechanism & slider crank mechanism

Module-II

Acceleration in Mechanisms Acceleration of a point on a link, Acceleration diagram, Coriolis component of acceleration, Crank and slotted lever mechanism, Klein's construction for Slider Crank crank mechanism Mechanisms with Lower Pairs Pantograph, Exact straight line

motion mechanisms-Peaucellier's, Hart and Scott Russell mechanisms, Approximate straight line motion mechanisms–Grass-Hopper, Watt and Tchebicheff mechanisms, Analysis of Hooke's joint, Davis and Ackermann steering gear mechanisms.

Module-III

FRICTION Laws of friction, Friction on inclined plane, Efficiency on inclined plane, Friction in journal bearing-friction circle, Pivots and collar frictionuniform pressure and uniform wear, Belt and pulley drive, Length of open and cross belt drive, Ratio of driving tensions for flat belt drive, centrifugal tension, condition for maximum power transmission, V belt drive Brakes & Dynamometers Shoe brake, Band brake, Band and Block brake, Absorption and transmission type dynamometers

Module-IV

CAMS Cams and Followers – Classification & terminology, Cam profile by graphical methods with knife edge and radial roller follower for uniform velocity, simple harmonic and parabolic motion of followers, Analytical methods of cam design – tangent cam with roller follower and circular cams with flat faced follower

Module-V

Gears & Gear Trains Classification & terminology, law of gearing, tooth forms &comparisons, Systems of gear teeth, Length of path of contact, contact ratio, interference & under cutting in involute gear teeth, minimum number of teeth on gear and pinion to avoid interference, simple, compound, reverted and planetary gear trains, Sun and planet gear.

Learning outcomes:

1. Build up critical thinking and problem solving capacity of various mechanical engineering problemsrelated to kinematics of machines.
2. Asses various concepts of mechanisms like straight line motion mechanisms, Steering gear mechanisms and working principles of power elements (Gears, gear trains, Cams, Belt and Chain drives) and design related problems effectively.

Utilize analytical, mathematical and graphical aspects of kinematics of Machines for effective design.

Books and References:

1. Theory of Machines – Thomas Bevan
2. Theory of Machines and Mechanisms- Shigley
3. Theory of Machines and Mechanisms-Ghosh & Mallik
4. Theory of Machines and Mechanisms- Rao & Dukkipati
5. Theory of Machines-S.S. Rattan
6. Kinematics of Machines-Dr. Sadhu singh
7. Mechanics of Machines – V. Ramamurti
8. Theory of Machines – Khurmi & Gupta
9. Theory of Machines – R. K. Bansal
10. Theory of Machines – V. P. Singh
11. Theory of Machines – Malhotra & Gupta

RKDF UNIVERSITY RANCHI

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	**FLUID MECHANICS & HYDRAULIC MACHINES**	**MEP - 402**

Objectives:

1. To learn about the application of mass and momentum conservation laws for fluid flows
2. To understand the importance of dimensional analysis
3. To obtain the velocity and pressure variations in various types of simple flows
4. To analyse the flow in water pumps and turbines.

Module-I

BASIC CONCEPTS AND PROPERTIES : Fluid – definition, distinction between solid and fluid - Units and dimensions - Properties of fluids - density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillary and surface tension - Fluid statics: concept of fluid static pressure, absolute and gauge pressures - pressure measurements by manometers and pressure gauges.

Module-II

FLIUD KINEMATICS AND FLUID DYNAMICS Fluid Kinematics - Flow visualization - lines of flow - types of flow - velocity field and acceleration - continuity equation (one and three dimensional differential forms)- Equation of streamline - stream function - velocity potential function - circulation - flow net – fluid dynamics - equations of motion - Euler's equation along a streamline - Bernoulli's equation – applications - Venturi meter, Orifice meter, Pitot tube - dimensional analysis - Buckingham's ? theorem- applications - similarity laws and models.

Module-III

INCOMPRESSIBLE FLUID FLOW Viscous flow - Navier - Stoke's equation (Statement only) - Shear stress, pressure gradient relationship - laminar flow between parallel plates - Laminar flow through circular tubes (Hagen poiseulle's) - Hydraulic and energy gradient - flow through pipes - Darcy - weisback's equation - pipe roughness -friction factor- Moody's diagram-minor losses - flow through pipes in series and in parallel - power transmission - Boundary layer flows, boundary layer

thickness, boundary layer separation - drag and lift coefficients.

Module-IV

HYDRAULIC TURBINES Fluid machines: definition and classification - exchange of energy - Euler's equation for turbo machines - Construction of velocity vector diagram's - head and specific work - components of energy transfer - degree of reaction.

Hydro turbines: definition and classifications - Pelton turbine - Francis turbine - propeller turbine - Kaplan turbine - working principles - velocity triangles - work done - specific speed - efficiencies - performance curve for turbines.

Module-V

HYDRAULIC PUMPS Pumps: definition and classifications - Centrifugal pump: classifications, working principles, velocity triangles, specific speed, efficiency and performance curves - Reciprocating pump: classification, working principles, indicator diagram, work saved by air vessels and performance curves - cavitations in pumps - rotary pumps: working principles of gear and vane pumps

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc22_ce85/preview

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Mathematically analyze simple flow situations
2. Evaluate the performance of various pumps and turbines.

TEXT BOOKS

1. Streeter, V.L., and Wylie, E.B., “Fluid Mechanics”, McGraw-Hill, 1983.
2. Kumar, K.L., “Engineering Fluid Mechanics”, Eurasia Publishing House (P) Ltd., New Delhi (7th edition), 1995.
3. Vasandani, V.P., “Hydraulic Machines - Theory and Design”, Khanna Publishers, 1992.

References Book

1. Bansal, R.K., "Fluid Mechanics and Hydraulics Machines", (5th edition), Laxmi publications (P) Ltd., New Delhi, 1995.
2. White, F.M., "Fluid Mechanics", Tata McGraw-Hill, 5th Edition, New Delhi, 2003.
3. Ramamirtham, S., "Fluid Mechanics and Hydraulics and Fluid Machines", Dhanpat Rai and Sons, Delhi, 1998.
4. Som, S.K., and Biswas, G., "Introduction to fluid mechanics and fluid machines", Tata McGraw-Hill, 2nd edition, 2004.

RKDF UNIVERSITY RANCHI

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	**MATERIAL SCIENCE & METALLURGY**	**MEP - 403**

Course Objectives:

This course provides students an understanding of basic structure and crystal arrangement of materials, the phase diagrams, advantages of heat treatment and the method of heat treatment processes, powder metallurgy processes, the need and application of composite materials.

Module-I

Engineering Materials: Classification of plain carbon steels; composition, properties & applications of low, medium & high carbon steels. Alloy steels: Free cutting steels; structural steel, spring steel, tool steel, high speed steels stainless steels. Effects of alloy element on properties of steels. Type of Cast irons: composition, properties & applications of each. Properties of aluminium; alloy of aluminium , (wrought & cast alloys), properties of copper, copper alloys (Brasses & Bronzes); Introduction and application to nano materials. Powder metallurgy- property and application.

Module-II

Plastic Deformation of Metals: The tensile stress strain curve, Deformation by slip & by twinning, Dislocation theory, Theory of work hardening its effect on properties of metals, Recovery, Recrystallisation and grain growth; Hot and cold working of metals and their effect on mechanical properties, annealing, Introduction to creep, fracture and fatigue behavior of metals.

Module-III

Crystal Structure: Mechanism of crystallization; unit cells, space lattice and lattice constants; Crystal systems, and Bravias Lattices; Body centered cubic, Face centered cubic and Hexagonal closed packed structure; Miller indices for planes and directions; Crystal imperfections; point defects, line defects and surface defects. Manufacturing and properties of refractory (acid, basic and natural).

Module-IV

Heat Treatment of Steels: Definition, principle, and purpose of heat treatment. Description of heat treatment methods: Hardening, Annealing, Normalizing, Tempering and case hardening with microstructure changes. Mar-temping & Austempering, Hardenability and its determination. Precipitation Hardening. Isothermal Transformation of steel, Transformation on continuous cooling, Critical cooling rate, Heat treatment furnace.

Module-V

Phase Diagrams: Definition of phase, Equilibrium cooling of pure metals and binary alloys. Hume Rothery rule for solid solubility, Types of solid solution, Eutectic, Euteitoid and Peritectic reactions, Allotropy of iron, Iron-Iron carbon equilibrium diagram, relationship equilibrium diagram and properties of alloy.

Course Outcomes:

Upon completion of this course the student will be able to: 1. Identify the properties of metals with respect to crystal structure and grain size 2. Interpret the phase diagrams of materials 3. Classify and Distinguish different types of cast irons, steels and non ferrous alloys 4. Describe the concept of heat treatment of steels & strengthening mechanisms 5. Explain the powder metallurgy process, types and manufacturing of composite materials

List of Reference Books:

1. Introduction to physical Metallurgy by Sidney H. Avnen,.- Tata McGraw-Hill
2. Material Science & Metallurgy for Engineering by Dr.V.D. Kodgire.- Everest Pub. House, Pune.
3. Materials Science & Engineering by V. Raghavan.- Prentice Hall of India, New Delhi.
4. Heat Treatment principles & Technology by T.V. Rajan, O.P. sharma.-
5. Engineering Metallurgy Part –I by Raymond A. Higgins, ELBS.
6. Introduction to Engineering materials by B.K. Agrawal.-
7. Physical Metallurgy for Engineering by Donald S. Clark & Willbur R. Varney, EWP.
8. Engineering Material and Metallurgy by R.K. Rajput / S Chand
9. Material Science & Metallurgy for Engineering by O.P. Khanna, Dhanpat Rai.

RKDF UNIVERSITY RANCHI

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	**Advance Manufacturing Process**	**MEP - 404**

Course Objectives

The objective of the course is to provide the student the knowledge of modern manufacturing processes such as Ultrasonic machining, Abrasive machining processes, Electrochemical machining, Electro discharge machining & their modification into hybrid processes. Also to introduce them to advanced topics such as laser beam welding/ machining, Electron beam welding/ machining & state of art in various research areas.

Module-I

Metal Cutting: Single and multi-point cutting; Orthogonal cutting, various force components: Chip formation, Tool wear and tool life. Surface finish and integrity, Machinability, Cutting tool materials, cutting fluids coating; Turning, Drilling, Milling and finishing processes, Introduction to CNC machining

Module-II

Metal Shaping and Forming: Metal working, Elastic and plastic deformation, Concept of strain hardening, Hot and cold working, Rolling, Principle and operations, Roll pass sequence, Forging, Forging operations, extrusion, Wire and tube drawing processes. Forging: Method of forging, Forging hammers and presses, Principle of forging tool design, Cold working processes: Shearing, Drawing Squeezing, Blanking, Piercing, deep drawing, Coining and embossing, Metal working defects, cold heading, Riveting, Thread rolling bending and forming operation. Numerical Calculation of Different process parameters of metal shaping and forming.

Module-III

Unconventional Machining Processes: Abrasive Jet Machining, Water Jet Machining Abrasive Water Jet Machining, Ultrasonic Machining principles and process parameters ,Electrical Discharge Machining principle and processes parameters, MRR, surface finish tool wear, dielectric, power and control circuits, wire EDM; Electro-chemical machining (ECM), etchant & maskant, process parameters, MRR and surface finish.Laser Beam Machining (LBM), Plasma Arc Machining (PAM)

and Electron Beam Machining

Module-IV

Plastic, Ceramic and Glass Processing: Classification of Plastics, Ingredients of Moulding compounds, General Properties of Plastics, Plastic part manufacturing processes such as compression moulding, Transfer moulding, Injection moulding, Extrusion moulding, Blow moulding, Calendaring, Thermoforming, slush moulding, laminating. Ceramic Structure, Properties, and Applications, Shaping Ceramics, Glasses Structure, Properties, and Applications, Forming and shaping of glass, Composite materials, Processing of metal matrix and ceramic matrix composites, Processing semiconductors.

Course Outcomes

Students will be able to select material processing technique with the aim of cost reduction, reducing material wastage & machining time. Students will be able to identify the process parameters affecting the product quality in various advanced machining of metals/ non-metals, ceramics and composites.

Books and References:

1. Kalpakjian and Schmid, Manufacturing processes for engineering materials (5th Edition)- Pearson India, 2014.
2. Mikell P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes, and Systems.
3. Manufacturing Technology by P.N. Rao., MCGRAW HILL INDIA.
4. Materials and Manufacturing by Paul Degarmo.
5. Manufacturing Processes by Kaushish, PHI.
6. Principles of Foundry Technology, Jain, MCGRAW HILL INDIA
7. Production Technology by RK Jain.
8. Degarmo, Black &Kohser, Materials and Processes in Manufacturing.

RKDF UNIVERSITY RANCHI

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	**Applied Thermodynamics**	**MEP - 405**

Course Objectives:

1. This course aims to provide a good platform to mechanical engineering students to understand, model and appreciate concept of dynamics involved in thermal energy transformation.
2. To prepare them to carry out experimental investigation and analysis at later stages ofgraduation.

Module-I

Combustion Thermodynamics:

Theoretical (Stoichiometric) air for combustion of fuels. Excess air, mass balance, Exhaust gas analysis, A/F ratio. Energy balance for a chemical reaction, enthalpy of formation, enthalpy and internal energy of combustion. Combustion efficiency. Dissociation and equilibrium, emissions.

Module-II

Vapour Power Cycles:

Carnot vapour power cycle, drawbacks as a reference cycle. Simple Rankine cycle; description, T-s diagram, analysis for performance. Comparison of Carnot and Rankine cycles. Effects of pressure and temperature on Rankine cycle performance. Actual vapour power cycles. Ideal and practical regenerative Rankine cycles, open and closed feed water heaters. Reheat Rankine cycle. Characteristics of an Ideal working fluid in Vapour power cycles, Binary Vapour cycles.

Module-III

Refrigeration Cycles:

Vapour compression refrigeration system; description, analysis, refrigerating effect. Capacity, power required, units of refrigeration, COP, Refrigerants and their desirable properties, alternate Refrigerants. Any one case study on cold storage or industrial refrigerator. Air cycle refrigeration; reversed Carnot cycle, reversed Brayton cycle, Vapour absorption refrigeration system. Steam jet refrigeration.

Module-IV

Pscychrometrics and Air-conditioning Systems:

Properties of Atmospheric air, and Psychometric properties of Air, Psychometric Chart, Analyzing

Air-conditioning Processes; Heating, Cooling, Dehumidification and Humidification, Evaporative Cooling. Adiabatic mixing of two moist air streams. Cooling towers.

Module-V

Reciprocating Compressors & Steam nozzles:

Reciprocating Compressors : Operation of a single stage reciprocating compressors. Work input through p-v diagram and steady state steady flow analysis. Effect of Clearance and Volumetric efficiency. Adiabatic, Isothermal and Mechanical efficiencies. Multistage compressor, saving in work, Optimum intermediate pressure, Inter-cooling, Minimum work for compression.

Steam nozzles: Flow of steam through nozzles, Shape of nozzles, effect of friction, Critical pressure ratio, Supersaturated flow.

Course Outcomes:

1) To apply the knowledge of mathematics, science and engineering fundamentals to model the energy conversion phenomenon.
2) To identify and formulate power production based on the fundamentals laws of thermal engineering.
3) To instill upon to envisage appropriate experiments related to heat engines.
4) To investigate the effectiveness of energy conversion process in mechanical power generation for the benefit of mankind.
5) To appreciate concepts learnt in fundamentals laws of thermodynamics from which learning ideas how to sustain in energy crisis and think beyond curriculum in the field of alternative and renewable sources of energy.
6) To communicate effectively the concepts of internal combustion engines and try to think beyond curriculum in alternative sources of energy.

TEXT BOOKS:

1. Rattan S.S, Theory of Machines,Tata McGraw-Hill Publishing Company Ltd., New Delhi, 4th Edition, 2014.
2. Ambekar A. G., Mechanism and Machine Theory, PHI, 2009. Thermodynamics an engineering approach, by Yunus A. Cenegal and Michael A. Boles. Tata McGraw hill Pub. Sixth edition, 2008.

3. Basic and Applied Thermodynamics" by P .K. Nag, Tata McGraw Hill, 2nd Edi. 2009
4. Fundamentals of Thermodynamics by G.J. Van Wylen and R.E. Sonntag, Wiley Eastern. Fourth edition 19993.

REFERENCE BOOKS:

1. Thermodynamics for engineers, Kenneth A. Kroos and Merle C. Potter, Cengage Learning, 2016
2. Principles of Engineering Thermodynamics, Michael J,Moran, Howard N. Shapiro, Wiley, 8th Edition
3. An Introduction to Thermo Dynamics by Y.V.C.Rao, Wiley Eastern Ltd, 2003.
4. Thermodynamics by Radhakrishnan. PHI, 2nd revised edition.

RKDF UNIVERSITY RANCHI

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	Dynamics of Machinery	MEP501

Course Objectives:

To make the student

- Understand the forces, torques and energy involved in different machine members
- Understand theory involved in the analysis of clutches, brakes, dynamometers and flywheels
- Aware of situations like speed fluctuations, rotor imbalance and machine vibration which appear inindustry

Module-I

FORCE ANALYSIS –

Rigid body dynamics in general plane equation-Equations of motion-Dynamic force analysis-Inertia force and inertia torque-D'Alemberts principle-The principle of superposition-Dynamic analysis in reciprocating engines-Gas forces-Equivalent masses-Bearing loads-Crank shaft torque-Turning moment diagrams-Fly wheels-Engine shaking forces-Cam dynamics-Unbalance, Spring, Surge and Windup.

Module-II

MECHANISMS FOR CONTROL : Governors-Types-Centrifugal governors-Gravity controlled and spring controlled centrifugal governors-Characteristics-Effects of friction-Controlling force-Other governor machanisms. Gyroscopes-Gyroscopic forces and torques-Gyroscopic stabilization-Gyroscopic effects in automobiles, ships and airplanes.

Module-III

BALANCING- Static and dynamic balancing-Balancing of rotating masses-Balancing a single cylinder engine- Balancing multi- cylinder engines-Partial balancing in locomotive engines-Balancing linkages- Balancing machines.

Module-IV

FRICTION: Frictional torque in pivots and collars by uniform pressure and uniform wear rate criteria. Boundary and fluid film lubrication, friction in journal and thrust bearings, concept of

friction circle and axis, rolling friction.

Clutches: Single plate and multi plate clutches, Cone clutches.

Module-V

BELT DRIVES: Velocity ratio, limiting ratio of tension; power transmitted; centrifugal effect on belts, maximum power transmitted by belt, initial tension, creep; chain and rope drives;

Brakes: Band brake, block brakes, Internal and external shoe brakes, braking of vehicles. Dynamometer: Different types and their applications.

Dynamic Analysis of Cams: Response of un-damped cam mechanism (analytical method), follower response analysis by phase-plane method, jump and cross-over shock.

Course Outcomes:

The student will be able to

- Analyze the effect of a gyroscope on ships, aero planes and automobile
- Explain the working of important machine elements like clutches, brakes, flywheels, governors
- Analyze the theory involved in balancing of rotating and reciprocating members
- Estimate the unbalanced forces in a multi-cylinder reciprocating engine
- Understand longitudinal, transverse and torsional vibrations so as to avoid resonance.

RKDF UNIVERSITY RANCHI

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	Heat Transfer	MEP 502

Course Objectives

1) Understand the fundamentals of heat transfer processes occurring in natural and engineered systems andconvey that understanding in course homework and exams.

2) Apply analytic procedures, numerical tools and problem-solving abilities to heat transfer problems suchas those assigned in course homework and exams.

3) Understand and perform experimental measurement techniques for heat transfer measurements as illustrated by written laboratory reports describing methods and results.

Module-I

Introduction to Heat Transfer: Concepts of the mechanisms of heat flows; Conduction, convection and radiation; Effect of temperature on thermal conductivity of materials; Introduction to combined heat transfer mechanism. 2 Conduction : One-dimensional general differential heat conduction equation in the rectangular, cylindrical and spherical coordinate systems; Initial and boundary conditions. Steady State one-dimensional Heat conduction : Composite Systems in rectangular, cylindrical and spherical oordinates withand without energygeneration; Thermal resistance concept; Analogy between heat and electricity flow; Thermal contact resistance; Critical thickness of insulation.

Module-II

Fins: Heat transfer from extended surfaces, Fins of uniform cross-sectional area Errors of measurement of temperature in thermometer wells. Transient Conduction: Transient heat conduction; Lumped capacitance method; Time constant; Unsteady state heat conduction in one dimension only, Heisler charts

Module-III

Forced Convection: Basic concepts; Hydrodynamic boundary layer; Thermal boundary layer; Approximate integral boundary layer analysis; Analogy between momentum and heat transfer in

turbulent flow over a flat surface; Mixed boundary layer; Flow over a flat plate; Flow across a single cylinder and a sphere; Flow inside ducts; Empirical heat transfer relations; Relation between fluid friction and heat transfer; Liquid metal heat transfer. Natural Convection : Physical mechanism of natural convection; Buoyant force; Empirical heat transfer relations for natural convection over vertical planes and cylinders, horizontal plates and cylinders, and sphere ; Combined free and forced convection.

Module-IV

Thermal Radiation : Basic radiation concepts; Radiation properties of surfaces; Black body radiation Planck's law, Wein's displacement law, Stefan Boltzmann law, Kirchoff's law; ; Gray body; Shape factor; Black-body radiation; Radiation exchange between diffuse non black bodies in an enclosure; Radiation shields; Radiation combined with conduction and convection; Absorption and emission in gaseous medium; Solar radiation; Green house effect.

Module-V

Heat Exchanger : Types of heat exchangers; Fouling factors; Overall heat transfer coefficient; Logarithmic mean temperature difference (LMTD) method; Effectiveness-NTU method; Compact heat exchangers. Condensation And Boiling : Introduction to condensation phenomena; Heat transfer relations for laminar film condensation on vertical surfaces and on outside & inside of a horizontal tube; Effect of non-condensable gases; Dropwise condensation; Heat pipes; Boiling modes, pool boiling; Hysteresis in boiling curve; Forced convective boiling. Introduction To Mass Transfer : Introduction; Fick's law of diffusion; Steady state equimolar counter diffusion; Steady state diffusion though a stagnant gas film.

Learning Outcomes

1) Able to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

2) Able to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions;

3) Able to acquire and apply new knowledge as needed, using appropriate learning strategies.

Books:

1. Elements of Heat transfer by Bayazitouglu & Ozisik, McGraw-Hill Book Company.
2. Heat Transfer By J.P. Holman, McGraw-Hill International edition.
3. Schaum's outline of Heat Transfer by Pitts & Sisson McGraw-Hill International edition.
4. Principles of Heat Transfer by Frank Kreith, McGraw-Hill Book co.
5. Fundamentals of Momentum, Heat and Mass Transfer by James R.Welty; John Wiley & Sons (Pvt). Ltd.
6. Heat Transfer, by Vijay Gupta, New Age International (P) Ltd. Publishers
7. Heat Transfer, by Y.V.C. Rao, University Press.
8. Heat Transfer, by R. Yadav, Central Publishing House, Allahabad.

RKDF UNIVERSITY RANCHI

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	Internal Combustion Engines	MEP503

Course Objectives:

The main objective of the course is to give the students an introduction to reciprocating internal combustion engine with emphasis on marine and stationary applications. The focus is on gaining understanding of the complex processes taking place in an engine with special attention to the detailed examination of a laboratory engine and the diagnostic systems utilized to conduct a detailed test.

The students are actively involved in a mini research project using the lab engine and expected to operate at every stage of a "research project" form designing the research project, performing data collection, evaluating, reporting.

Module-I

Internal Combustion Engine: S.I. and C.I. engines of two and four stroke cycles, determination of engine dimensions, speed, fuel consumption, output, mean effective pressure, efficiency, factors effecting volumetric efficiency, heat balance, cylinder arrangement, firing order, power balance for multi-cylinder engines, valve timing. Thermodynamic properties of fuel-air mixture before and after combustion, deviations of actual cycle from Ideal conditions.

Module-II

Combustion in S.I. Engines: The Process of combustion, Effects of engine variables on ignition lag and flame propagation, abnormal combustion, knocking, effects and control of knock, Knock theory, effects of engine variable on knock, S.I. Engine fuel properties, Knock rating of fuel, octane number, additives, requirements of combustion chamber, Design Principles, Types of combustion chambers, merits.

Combustion in C.I. Engines: Combustion Process, Stages, diesel knock, effects of operating parameters on knock, knock Control, rating of C.I. engine fuels, Cetane number, types and requirements of the combustion chambers.

Emission and Control: SI and CI engine emissions, effects of pollutants on human health and biological sphere, Control of emissions from SI and CI Engines, Introduction to Noise Pollution & its Control.

Module-III

Engine Operating Systems: Valves and valve gear, lubrication systems, and system components, lubricating oils, properties and rating, additives. Cooling systems, temperature gradients in engine parts, various methods of cooling, Power absorbed in cooling, Properties of coolants, additives. Fuel systems for SI and CI engines, F/A ratio requirements for different operating conditions, fuel transfer pump, fuel injection pump, injector, Modern carburetors, MPFI in SI engines. Conventional & Modern Ignition system, firing order.

Module-IV

Engine Performance: Testing of Engines - their performance characteristics, Heat Balance sheet, Scavenging processes, Volumetric, charging and scavenging efficiencies, scavenging methods and systems of four stroke and two stroke engines.

Module-V

Supercharging: Supercharging suitability for SI and CI engines and effect of attitude on mixture strength and output of S.I. engines, Types of supercharging, analysis and performance, low and high pressure super charging, exhaust, gas turbo-charging, supercharging of two stroke engines.

Learning outcome

The introduction to internal combustion engines is based on explaining processes and performance byapplication of first principles in:

1. thermodynamics,
2. combustion (chemistry, fuels, emissions),
3. heat transfer
4. fluid flow-gas exchange
5. mechanical dynamics.

This approach provides a basis for analysing and understanding the complex interactions between subsystems and processes inside the engine system.

List of Reference Books:

1. I.C. Engine by M.L. Mathur, R.P.Sharma; Dhanpat Rai Pub.
2. I.C. Engine by V. Ganeshan ; Tata McGra Hill.
3. I.C. Engines by Anand V. Domkundwar, V.M. Domkundwar; Dhanpat Rai Pub

RKDF UNIVERSITY RANCHI

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	Machine Component Design	MEP504

Course Objectives:

1. Enable students to attain the basic knowledge required to understand, analyze, design and select machine elements required in transmission systems.
2. Reinforce the philosophy that real engineering design problems are open-ended andchallenging
3. Impart design skills to the students to apply these skills for the problems in real life industrial applications
4. Inculcate an attitude of team work, critical thinking, communication, planning and scheduling through design projects
5. Create awareness amongst students about safety, ethical, legal, and other societal constraints in execution of their design projects.
6. Develop a holistic design approach to find out pragmatic solutions to realistic domestic and industrial problems

Module-I

Introduction to basic design concepts, design process, stages/phases in design, flowchart, problem formulation, design considerations (strength, manufacturing, maintenance, environment, economics and safety); design for recycle and reuse, Design and safety factors for steady and variable loads, impact and fatigue considerations, reliability and optimization, standardization in design.

Module-II

POWER TRANSMISSIONS SYSTEMS, PULLEYS: Transmission of power by Belt and Rope drives, Transmission efficiencies, Belts – Flat and V types – Ropes - pulleys for belt and rope drives, Materials, Chain drives.

SPUR & HELICAL& BEVEL GEAR DRIVES : Spur gears- Helical gears – Load concentration factor- Dynamic load factor. Surface compressive strength – Bending strength – Design analysis of spur gears – Estimation of centre distance, module and face width, check for plastic deformation.

Check for dynamic and wear considerations. Design bevel gear and its application.

Module-III

Springs: Design of helical compression and tension springs, leaf springs and torsion springs; fatigue loading of springs, surge in spring.

Shafts: Design of shaft under combined bending, twisting and axial loading; shock and fatigue factors, design for rigidity; Design of shaft subjected to dynamic load; Design of keys and shaft couplings.

Module-IV

BEARINGS : Types of Journal bearings – Lubrication – Bearing Modulus – Full and partial bearings – Clearance ratio – Heat dissipation of bearings, bearing materials – journal bearing design – Ball and roller bearings – Static loading of ball & roller bearings, Bearing life.

Design of power screws: Design of screw, Square ACME, Buttress screws, design of nut, compound screw, differential screw, ball screw- possible failures.

Module-V

Brakes & Clutches: Materials for friction surface, uniform pressure and uniform wear theories, Design of friction clutches: Disk , plate clutches, cone & centrifugal clutches. Design of brakes: Rope, band & block brake, Internal expending brakes, Disk brakes

Engine Parts : Connecting Rod : Thrust in connecting rod – stress due to whipping action on connecting rod ends – Cranks and Crank shafts, strength and proportions of over hung and center cranks – Crank pins, Crank shafts.

References:

1. Shingley J.E; Machine Design; TMH
2. Machine Desine by R. S. Khurmi , S Chand
3. Sharma & Agrawal; Machine Design; Kataria & sons
4. Machine Design, V.Bandari Tmh Publishers
5. Machine Design, S MD Jalaludin, Anuradha Publishers
6. Sharma and Purohit; Design of Machine elements; PHI
7. Data Books : (I) P.S.G. College of Technology (ii) Mahadevan

Course Outcomes:

1. To understand and apply principles of gear design to spur gears and industrial spur gearboxes.
2. To become proficient in Design of Helical and Bevel Gear.
3. To develop capability to analyze Rolling contact bearing and its selection from manufacturer's Catalogue.
4. To learn a skill to design worm gear box for various industrial applications.
5. To inculcate an ability to design belt drives and selection of belt, rope and chain drives.
6. To achieve an expertise in design of Sliding contact bearing in industrial applications.

RKDF UNIVERSITY RANCHI

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	**Design for Manufacturing**	MEPE505

Objectives

- To educate students on factors to be considered in designing parts and components with focus on manufacturability.
- To impart the knowledge on design considerations for designing components produced using various machining operations.

Module-I

Introduction: Overview of the course, Design for manufacturing, Typical Case studies, Innovative product and service designs.

Module-II

Material Selection: Requirements for material selection, systematic selection of processes and materials, ASHBY charts

Module-III

Design for Casting: Basic characteristics and Mold preparation, Sand casting alloys, Design rules for sand castings, Example calculations, Investment casting overview, Cost estimation, Number of parts per cluster, Ready to pour liquid metal cost, Design guidelines for Investment casting, Die casting cycle, Determination of optimum number of cavities, appropriate machine size, Die cost estimation, Design principles.

Module-IV

Design for Injection molding: Injection molding systems, Molds, molding cycle time, mold cost estimation, estimation of optimum number of cavities, Assembly techniques, Design Guidelines.

Module-V

Design for Hot Forging: Characteristics of the forging process, forging allowances, flash removal, die cost estimation, Die life and tool replacement costs.

Module-VI

Design for Sheet metal working: Press selection, press brake operations, Design rules, Design for

Powder Metal processing: Powder metallurgy, tooling and presses for Compaction, Sintering, materials, heat treatments.

Course Outcomes:

- Understand the design principles of design for manufacturing processes
- Estimates the cost of dies, molds and machined components based on die life.
- Understand the design for manual assembly and automated assembly.
- Design typical assemblies using principles of design for X concepts.

Understand the design rules for machining with single point and multi point cutting tools.

Text Books:

1. Geoffrey Boothroyd, Dewhurst.P, Knight.W, roduct design for manufacture and assembly,
2. CRC press, 2002
3. George E Dieter, Engineering Design- A material processing approach, 5/E. Mc Graw hill international,2003.
4. ASM Handbook, Design for manufacture, 2000.

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BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	**Energy system & Management**	MEPE506

Objectives:

- To understand the basics of Energy Resources.
- To understand the Energy Conversion Systems and Management.
- To learn about basic concept of Power Systems Engineering.

Module-I

Energy resources and their utilization: Indian and global energy sources, Energy exploited, Energy planning, Energy Parameters (energy intensity, energy-GDP elasticity), Introduction to various sources of energy, Solar thermal, Photovoltaic, Water power, Wind energy, Biomass, Ocean thermal, Tidal and wave energy, Geothermal energy, Hydrogen energy systems, Fuel cells, Decentralized and dispersed generation.

Module-II

Solar radiations: Extra terrestrial radiation, Spectral distribution, Solar constant, Solar radiations on earth, Measurement of solar radiations, Solar radiation geometry, Flux on a plane surface, Latitude, Declination angle, Surface azimuth angle, Hour angle, Zenith angle, Solar altitude angle expression for angle between incident beam and the normal to a plane surface (no derivation), Local apparent time, Apparent motion of sun, Day length, Solar radiation data for India.

Module-III

Energy Conversion Systems I: Energy, Conversion routes, Direct and indirect way of Energy Conversion, Principles of heat and mass transfer, Thermodynamics, Fluid static and dynamics, Electricity generation, distribution and use, Basic of Solar Thermal Conversion, Technology of Selective Coating, Fundamentals of Flat Plate Collector and Evacuated Collector, Basic of Wind Energy Conversion, Wind machine, Wind electric generator, Wind pump.

Module-IV

Energy Conversion Systems II: Basics of Photovoltaic Conversion technology and PV systems, PV

system design methodologies, Basics of Bio-energy conversion, biomethanation technology, Thermochemical Conversion through Pyrolysis, Gasification and Esterification, Bio Oil, Application of Ocean Thermal Gradient and Geothermal gradient for power generation, Basics of hydropower, Tidal and Wave power, Basics of Hydrogen fuel, Fundamentals of Fuel Cells, Basics of Fusion power, Energy Storage Technologies, Mechanical storage, Chemical storage and Electrical storage, Details of Pb-acid battery, Ni- Cd-alkaline battery, Ni-iron and Na-S batteries, battery maintenance and safety precautions.

Module-V

Energy Management: Fundamental of Energy conservation, Energy Management and Audit, Basics of Energy Demand and Supply, Principles of Economic analysis in the Energy Management and Audit Programme, Supply side and demand side energy management, Boilers and Firing System, Steam, Condensation Systems, Energy Conservation and Management in power plant, Energy conservation in Buildings, Heating, Ventilation and Air Conditioning System, Degree day in energy use monitoring, Energy Conservation Opportunities, in chemical industries, Waste heat recovery, Co-generation, Energy Conservation in Agricultural Sector, Energy conservation in illumination engineering, Combustion stoichiometry, air-fuel ratio, optimum loading in boilers, etc

Module-VI

Industrial Energy Analysis: Materials and energy balance in the industries, Products and the process, industrial demand and supply networking, Optimization techniques, efficiency analysis, methods, Energy monitoring and ongoing information dissertation in terms of energy consumption, production and cumulative sum of differences. Energy efficiency analysis in various conversion systems like boilers, furnaces, compression systems, controlling systems, etc. Case studies for large scale, medium scale and small scale industries, efficiency integration methodologies.

Course Outcomes:

Upon completion of this course, students will be able to understand Energy Resources, Energy Conversion Systems and Energy Management.

Reference Books:-

1. Albert Thumann, Handbook of Energy Audits, The Fairmont Press Inc., Atlanta gergia, 1979.
2. Murphy W.R and Mckay G, Energy Management, Butterworths, London, 1982.
3. Albert Thumann, Plant Engineer and Management guide to Energy Conservation, Van Nost and Reinhold Co., Newyork.
4. Energy Audits, E.E.O.-Book-lets, U.K. 1988.
5. Craig B.Smith, "Energy Management Principles", Pergamon Press.
6. The role of Energy Manager, E.E.O., U.K.
7. The Energy conservation Design Resource Hand Book-The Royal architectural Institute of Canada.
8. Non-Conventional Energy Resources by B.H . Khan, Tata McGraw Hill
9. Solar Energy – S.P.Sukhatme, Tata mcgraw hill co.

RKDF UNIVERSITY RANCHI

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	**Machine Tool Design**	**MEPE 507**

Module-I

Introduction to Machine Tools: Classification, similarities; various cutting tools and cutting fluids: speed of cutting, feed rate, machining rate and machining time.

Module-II

Lathe: Construction, important mechanisms viz. apron, tail stock, head- stock, feed box; specification, operations e.g., taper turning, eccentric turning, screw cutting.

Module-III

Milling machine: Construction, types specifications; cutters, dividing head, simple compound and differential indexing; various operations: Slab milling, angle cutting, slot milling, fly milling, slit gear milling, spur and bevel, T- slot milling, nature of operations, up and down milling.

Module-IV

Shaper, Slotter, Planer: Construction, automatic feed mechanism, quick return mechanisms: operations e.g., horizontal, vertical and inclined machining, spline cutting, keyway cutting, contour machining.

Module-V

Drilling machine: Construction, feed mechanism: Specification, geometry and nomenclature of twist drill, operations e.g. reaming, boring, tapping.

Module-VI

Grinding Machines: M, N types and construction features, Operations e.g. Plane, cylindrical, internal and centreless grinding, tool and cutter grinding, grinding wheels- specifications, shapes,

setting, dressing, truing.

Text Books:

1. B.L. Juneja, G.S. Sekhon & Nitin Seth, Fundamentals of Metal Cutting & Machine Tools, New Age International Publications
2. P.N. Rao, Manufacturing Technology: Metal Cutting & Machine Tools, Tata McGraw Hill Publications.
3. G.K. Lal, Introduction to Machining Science, New Age International Publications.
4. B.S. Raghuwanshi, Workshop Technology , Dhanpat Rai & Sons, Publications

RKDF UNIVERSITY RANCHI

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	**Hydrology and Water Resources**	CIOE 508

Course Objectives: This course will enable students to

1. Understand the concept of hydrology and components of hydrologic cycle such as pricipitation, infiltration,evaporation and transpiration.
2. Quantify runoff and use concept of unit hydrograph.
3. Demonstrate different methods of irrigation, methods of application of water and irrigation procedure.
4. Design canals and canal network based on the water requirement of various crops.
5. Determine the reservoir capacity.

Module-I

Definition and scope of hydrology, importance of water, hydrological cycle, water storages – glaciers, river channels, lakes and reservoirs, soil moisture,, ground water

Module-II

Surface water: sources and factors affecting quality and quantity; precipitation: forms and factors; interception: factors; runoff: sources and factors affecting runoff; evaporation: measurement and factors; evapotranspiration: control and factors.

Module-III

Ground water: characteristics of stream flow, Darcy's law, permeability, infiltration, ground water storage, ground water aquifers in different rock systems, movement and discharge.

Module-IV

Environmental influences on water resources; sectoral demands for water; urban water supply; water management; water harvesting; water pollution and control.

References:

- Timothy, Davie. 2003. Fundamentals of Hydrology. Routledge, Taylorand FrancisGroup, U.K.
- Todd, D.K. 2009. Groundwater Hydrology. John Wiley & Sons Inc.
- Mahajan, G. 1989. Evaluation and Development of Groundwater. Ashish PublishingHouse, New Delhi.
- Karanth, K.R.C. 1988.Ground Water: Exploration, Assessment and Development. Tata-Mcgraw Hill, New Delhi.
- Andrew D. Ward and Stanley Trimble. 2004(2nd edition). Environmental Hydrology.Lewis Publishers.

Course Outcome :-

1 Student will know the different terminologies related with hydrology .

2 Students will analyze hydrological parameters required for water resource management.

3 Student will assess ground water potential .

4 Students will identify suitable method of irrigation and drainage of waterlogged area .

Text/Reference Books:

1. K Subramanya, Engineering Hydrology, Mc-Graw Hill.
2. K N Muthreja, Applied Hydrology, Tata Mc-Graw Hill.
3. K Subramanya, Water Resources Engineering through Objective Questions, Tata McGraw Hill.
4. G L Asawa, Irrigation Engineering, Wiley Eastern
5. L W Mays, Water Resources Engineering, Wiley.
6. J D Zimmerman, Irrigation, John Wiley & Sons
7. C S P Ojha, R Berndtsson and P Bhunya, Engineering Hydrology, Oxford

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BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	INDUSTRIAL INSTRUMENTATION	EEEOE 509

COURSE OBJECTIVES

1. To introduce the measurement techniques of force, torque and speed
2. To introduce the measurement techniques of acceleration, Vibration and density
3. To introduce the measurement Viscosity, Humidity and moisture.
4. To introduce the temperature measurement techniques
5. To introduce the pressure measurement techniques

Module I

Measurement of Force, Torque And Speed

Different types of load cells: Hydraulic, Pneumatic, Strain gauge, Magneto-elastic and Piezoelectric load cells – Different methods of torque measurement: Strain gauge, Relative angular twist. Sped measurement: Capacitive tacho, Drag cup type tacho, D.C and A.C tacho generators – Stroboscope.

Module II

Measurement of Acceleration, Vibration And Density

Accelerometers: LVDT, Piezoelectric, Strain gauge and Variable reluctance type accelerometers – Mechanical type vibration instruments – Seismic instruments as accelerometer – Vibration sensor – Calibration of vibration pickups – Units of density and specific gravity – Baume scale and API scale – Densitometers: Pressure type densitometers, Float type densitometers, Ultrasonic densitometer and gas densitometer.

Module III

Measurement of Viscosity, Humidity And Moisture

Viscosity: Say bolt viscometer – Rotameter type and Torque type viscometers – Consistency Meters – Humidity: Dry and wet bulb psychrometers – Resistive and capacitive type hygrometers – Dew cell – Commercial type dew meter. Moisture: Different methods of moisture measurements – Thermal, Conductivity and Capacitive sensors, Microwave, IR and NMR sensors, Application of moisture measurement – Moisture measurement in solids.

Module IV

Temperature Measurement

Definitions and standards – Primary and secondary fixed points – Different types of filed in system thermometers – Sources of errors in filed in systems and their compensation – Bimetallic thermometers – IC sensors – Thermocouples: Laws of thermocouple, Fabrication of industrial thermocouples, Reference junctions compensation, Signal conditioning for thermocouple, Commercial circuits for cold junction compensation, Response of thermocouple, Special techniques for measuring high temperature using thermocouple – Radiation fundamentals – Radiation methods of temperature measurement – Total radiation pyrometers – Optical pyrometers – Two colour radiation pyrometers – Fibre optic sensor for temperature measurement – Thermograph, Temperature

switches and thermostats – Temperature sensor selection, Installation and Calibration.

Module V

Pressure Measurement

Units of pressure – Manometers: Different types, Elastic type pressure gauges: Bourdon tube, Bellows, Diaphragms and Capsules – Electrical methods: Elastic elements with LVDT and strain gauges – Capacitive type pressure gauge – Piezo resistive pressure sensor-Resonator pressure sensor – Measurement of vacuum: McLeod gauge, Thermal conductivity gauge, lionization gauges, Cold cathode type and hot cathode type – Pressure gauge selection, installation and calibration using dead weight ester.

Branch	Subject Title	Subject Code

RKDF UNIVERSITY RANCHI

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

B.Tech. ME	Python Programming	CSOE 510

Learning Objectives:

When students complete Intro to Programming with Python, they will be able to: Build basic programs using fundamental programming constructs like variables, conditional logic, looping, and functions. Work with user input to create fun and interactive programs.

Module – I

Introduction to Computers, Programs, and Python: Introduction, Programming Languages, Operating Systems, The History of Python, Features of python language, Getting Started with Python, Programming Style and Documentation, Programming Errors.

Elementary Programming: Introduction, Writing a Simple Program, Reading Input from the Console, Identifiers, Variables, Assignment Statements, and Expressions, Simultaneous Assignments, Named Constants, Numeric Data Types and Operators, Evaluating Expressions and Operator Precedence, Augmented Assignment Operators, Type Conversions and Rounding.

Module – II

Mathematical Functions, Strings,and Objects: Introduction, Common Python Functions, Strings and Characters, Introduction to Objects and Methods, Formatting Numbers and Strings.

Control Structures: Selections:Introduction, Boolean Types, Values, and Expressions,if Statements, Two-Way if-else Statements, Nested if and Multi-Way if-elif-else Statements, Logical Operators, Conditional Expressions, Loops: Introduction, The while Loop, The for Loop, Nested Loops,Keywords break and continue

Module – III

Functions: Introduction, Defining a Function, Calling a Function, Functions with/without Return Values, Positional and Keyword Arguments, Passing Arguments by Reference Values, Modularizing code, The Scope of Variables, Default Arguments, Returning Multiple Values.

Lists: Introduction, List Basics, Copying Lists, Passing Lists to Functions, Returning a List from a Function, Searching Lists, Sorting, Processing Two-Dimensional Lists, Passing Two- Dimensional Lists to Functions, Multidimensional Lists.

Module – IV

Tuples, Sets, and Dictionaries: Introduction, Tuples: Creating Tuples, Basic Tuple Operations, Indexing and Slicing in Tuples, Tuple methods, Sets: Creating Sets, Manipulating and Accessing Sets, Subset and Superset, Set Operations, Comparing the Performance of Sets and Lists, Dictionaries: Creating a Dictionary, Adding, Modifying, and Retrieving Values, Deleting Items, Looping Items, The Dictionary Methods.

Module – V

Objects and Classes: Introduction, Defining Classes for Objects, Immutable Objects vs. Mutable Objects, Hiding Data Fields, Class Abstraction and Encapsulation, Object-Oriented Thinking.Inheritance and Polymorphism: Introduction, Superclasses and Subclasses, Overriding Methods, The **object** Class, Polymorphism and Dynamic Binding, The **isinstance**Function. Class Relationships: Association, Aggregation, composition.

Files and Exception Handling: Introduction, text input and ouput: opening a file, Writing Data, Testing a File's Existence, Reading All Data from a File, Writing and Reading Numeric Data, Binary IO Using Pickling, Exception Handling, Raising Exceptions.

TEXT BOOK

1. Y. Daniel Liang, "Introduction to programming using python", Pearson Education; First edition (2017).

REFERENCE BOOK

1. Martin C. Brown, "Python: The Complete Reference", McGraw Hill Education; Forth edition (2018)
2. Mark Lutz, "Learning Python" O′Reilly Fifth edition (2013)
3. Mark Summerfield, "Programming in Python 3: A Complete Introduction to the Python Language" Pearson Education; Second edition (2018)

Python Programming Lab SYLLABUS

List of Programs as Assignments:

1. Write a program that displays "Hello to Python programming".
2. Write a program to read two integers and perform arithmetic operations on them (addition, subtraction, multiplication and division).
3. Write a program to read the marks of three subjects and find the average of them.

4. Surface area of a prism can be calculated if the lengths of the three sides are known. Write a program that takes the sides as input (read it as integer) and prints the surface area of the prism (Surface Area = 2ab + 2bc + 2ca)

5. plane travels 395,000 meters in 9000 seconds. Write a program to find the speed of the plane (Speed = Distance / Time).

6. You need to empty out the rectangular swimming pool which is 12 meters long, 7 meters wide and 2 meter depth. You have a pump which can move 17 cubic meters of water in an hour. Write a program to find how long it will take to empty your pool? (Volume = l * w * h, and flow = volume/time).

7. Write a program to convert temperature from centigrade (read it as float value) toFahrenheit.

8. A car starts from a stoplight and is traveling with a velocity of 10 m/sec east in 20 seconds. Write a program to find the acceleration of the car. [acc = ($V_{final} - V_{initial}$)/ Time].

9. Write a Program to Prompt for a Score between 0.0 and 1.0. If the Score Is Out of Range, Print an Error. If the Score Is between 0.0 and 1.0, Print a Grade Using the Following Table

Score	Grade
>= 0.9	A
>= 0.8	B
>= 0.7	C
>= 0.6	D
< 0.6	F

10. Write a Program to find the maximum of three numbers.

RKDF UNIVERSITY RANCHI

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	**Production & Operation Management**	**MEP 601**

Objectives:

1. To provide knowledge on machines and related tools for manufacturing various components.
2. To understand the relationship between process and system in manufacturing domain.
3. To identify the techniques for the quality assurance of the products and the optimality of the process in terms of resources and time management.

Contents

Module I

Introduction: Scope of production management. Production system and resources (machines, tooling, etc.); Types of production (batch, flow and unit), Roles of line supervisors and production managers.

Module II

Project Management: Project life cycle: concept phase (RFQ, Quotations, Proposals), Project initiations, DPR preparation (project value, business case development and feasibility study); Project planning (obtaining resources, acquiring financing and procuring required materials); Project team, producing quality outputs, handling risk, acceptance criteria; Project execution (allocation of resources, scheduling, building deliverables); Project Monitoring and control: Project networks, progress review (physical and financial), CPM and PERT, critical path, re-scheduling; Project closure: acceptance of project deliverable; Analytics: Performance, capability aggregation, cost benefit analysis, variability analysis, Output-outcome analysis, project documentation, best practices, and depository.

Module III

Production Planning and Control: Production planning, Process planning, Resource planning, demand-utility mapping (production capability index, forecasting models, aggregate production planning, materials requirement planning); Inventory Management: Economic order Quantity, discount models, stochastic inventory models, practical inventory control models, JIT; Supply chain

and management.

Module IV

Factory Management: Factory layout: line balancing, material flow and handling, Lean and green manufacturing, Human resource management, Training need analysis, Advantage and opportunities for Digitalization, Advanced factory systems: TQM; Important acts, regularities and safety norms, Reliability assessment of processes, Block chain, Energy management, Efficiency & throughput, Overall equipment effectiveness. Process capability, lean manufacturing.

Module V

Operation Management: Linear programming, objective function and constraints, graphical method, Simplex and duplex algorithms, transportation assignment; Simple queuing theory models; Traveling Salesman problem; Network models: shortest route, minimal spanning tree, maximum flow model.

Text /Reference Books:

1. L.J. Krajewski and L.P Ritzmen, Operations Management: Strategy and Analysis, Pearson, 2010.
2. R.B. Chase, F.R. Jacobs and N.J. Aquilano, Operations Management for Competitive Advantage, Tata McGraw Hill, 2011.
3. W. J. Hopp and M. L. Spearman, Factory Physics: Foundations of Manufacturing Management, McGraw Hill International Edition, 2008.
4. Mahadevan. B., Operations Management: Theory and Practice, Pearson, 2015.
5. Taha H. A., Operations Research, 6th Edition, PHI India, 2003.
6. M.P. Poonia, Total Quality Management, Khanna Publishing House, 2022.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc20_mg06/preview

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. To provide knowledge on production management techniques that develop and establish relationship between market demand and production capability.
2. To understand the operation management: Resource planning and their utility
3. To understand the scientific approach and tools and techniques that assure market competitiveness by ensuring the quality, cost and time.

RKDF UNIVERSITY RANCHI

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	Mechanical Measurement & Metrology	MEP602

Course Objective:

To introduce techniques and instrumentation used in mechanical measurement and Metrology.

Module-I

Mechanical Measurements Introduction: Introduction to measurement and measuring instruments, Generalized measuring system and functional elements, units of measurement, static and dynamic performance characteristics of measurement devices, calibration, concept of error, sources of error, statistical analysis of errors. Sensors and Transducers: Types of sensors, types of transducers and their characteristics Signal transmission and processing: Devices and systems. Signal Display & Recording Devices.

Module-II

Statistics: Least square regression analysis and data outlier detection; Normal distribution and concept of standard deviation of the mean in finite data set, Uncertainty Analysis: Measurement errors; error sources: calibration, data acquisition, data reduction; Design stage uncertainty analysis; combining elemental errors; Bias & Precision errors; Error propagation, Higher order uncertainty analysis.

Module-III

METROLOGY: Metrology and Inspection: Standards of linear measurement, line and end standards .Limit fits and tolerances. Interchange ability and standardization. Linear and angular measurements devices and systems Comparators: Sigma, Johansson'sMicrokrator. Limit gauges classification, Taylor's Principle of Gauge Design.

Module-IV

Measurement of geometric forms like straightness, flatness, roundness. Tool maker's microscope, profile project autocollimator. Interferometer: principle and use of interferometer, optical flat.

Measurement of screw threads and gears. Surface texture : quantitative evaluation of surface roughness and its measurement.

Module-V

Introduction: Concept of Automatic Controls – open loop & closed loop systems. Servomechanisms. Block diagrams, transfer functions. Applications of Laplace-Transform in control systems with simple examples / numerical. Controllers: Brief introduction to Pneumatic, hydraulic and electric controllers Modeling: Modeling of mechanical systems, modeling of electrical systems, signal flow graphs, modeling of fluid systems, liquid level systems, hydraulic systems, modeling of thermal systems.

Course Outcomes

At the end of this course students will be able to …

1. Interpret characteristics of measuring instruments.
2. Apply methods of measurement for various physical quantities.
3. Use instruments for linear and angular measurement

Use devices for gear, screw threads and surface finish measurements.

References

1. Beckwith Thomas G., Mechanical Measurements, Narosa Publishing House, N. Delhi.
2. Doeblein E.O., “Measurement Systems,Application Design”, McGraw Hill, 1990.
3. Kumar D.S., “Mechanical Measurements and Control”, Metropolitan, N. Delhi.
4. Hume K.J., “Engineering Metrology”, MacDonald and Co. 1963
5. Gupta, I.C., “Engineering Metrology”,Dhanpat Rai & Sons, New Delhi, 1994
6. Sirohi, “Mechanical Measurement” New Age Publishers
7. Jain, R.K., “Engineering Metrology” Khanna Publishers
8. Jain, R.K., “Mechanical Measurement” Khanna Publishers
9. Raven, “Automatic Control Theory”, McGraw Hill Publishers.
10 Nagrath and Gopal, “Control System Engineering”, New Age Publishers.

RKDF UNIVERSITY RANCHI

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	**CAD/CAM**	**MEP603**

Course Objectives:

1. Impart knowledge of computer aided design and manufacturing (CAD/CAM) techniques.
2. Develop programming and operating skills for computer numerical control (CNC) machines.
3. Enable students understand various stages of product development and their management.

Module-I

Principles of Computer Graphics: Point plotting, drawing of lines, Bresenham's circle algorithm. Transformation in Graphics: Co-ordinate system used in Graphics and windowing, view port, views. 2D transformations – rotation, scaling, translation, mirror, reflection, shear - homogeneous transformations – concatenation. 3D Transformation – Perspective Projection – Technique (Description of techniques only). Geometric Modelling: Classification of Geometric Modelling – Wire frame, Surface and Solid Modelling, applications – representation of curves and surfaces – Parametric form. Design of curved shapes- Cubic spline – Bezier curve – B-spline – Design of Surfaces - features of Surface Modelling Package – Solid Primitives, CSG. B-rep and description of other modelling techniques like Pure primitive instancing, cell decomposition, spatial occupancy enumeration, Boolean Operations (join, cut, intersection), Creating 3D objects from 2D profiles (extrusion, revolving etc).

Module-II

Graphics standard & Data storage: Standards for computer graphics GKS, PHIGS. Data exchange standards – IGES, STEP - Manipulation of the model - Model storage. Finite Element Modelling: Introduction, Mesh Generation – mesh requirements. Semi-Automatic Methods- Node-based approach, Region based approach, Solid-modelling-based methods. Fully Automatic Methods-Element-based approach, Application, Mesh Refinements using Isoperimetric Finite Elements, Meshing in high gradient areas, Transition Regions. Sub modelling Concept. An overview of modelling software's like PRO-E, CATIA, IDEAS, SOLID EDGE etc.

Module-III

CAM: Scope and applications – NC in CAM – Principal types of CNC machine tools and their construction features – tooling for CNC – ISO designation for tooling – CNC operating system – FANUC, SINUMERIK – LINUMERIK. Programming for CNC machining – coordinate systems – manual part programming – computer assisted part programming – CNC part programming with CAD system. Material handling in CAM environment: Types – AGVS – AS/RS – Swarf handling and disposal of wastes – single and mixed mode assembly lines – quantitative analysis of assembly systems.

Module-IV

Robotics: Classification and specification – drive and controls – sensors - end effectors - grippers-tool handling and work handling – machine vision – robot programming concepts – case studies in assembly. Quality Function Deployment: Process Planning – CAPP – Variant and Generative systems- Concurrent Engineering and Design for Manufacturing. Advanced manufacturing Planning Computer Aided Production Planning and Control – Aggregate production planning and master production schedule – MRP – MRP II – ERP - Capacity planning.

Module-V

Rapid prototyping: Need for rapid prototyping, Basic principles and advantages of RP, General features and classifications of different RP techniques with examples. Introduction to three representative RP techniques: Fusion Deposition Modelling, Laminated Object Manufacturing and Stereo-lithography. Flexible manufacturing cells: Systems – characteristics – economics and technological justification – planning, installation, operation and evaluation issues – role of group technology and JIT in FMS – typical case studies future prospects.

Books and References:

1. Chris Mcmahon and - CAD/CAM – Principle Practice and Manufacturing Management,Jimmie Browne Addision Wesley England, Second Edition,2000.
2. Dr.Sadhu Singh - Computer Aided Design and Manufacturing, Khanna Publishers, NewDelhi, Second Edition,2000.
3. P.Radhakrishnan, - CAD/CAM/CIM, New Age International (P) Ltd., New Delhi.S.Subramanayanand V.Raju.

4. Groover M.P. and - CAD/CAM; Computer Aided Design and Manufacturing, Prentice HallZimmers EW. International, New Delhi, 1992.
5. Ibrahim Zeid - CAD/CAM theory and Practice, Tata McGraw Hill Publishing Co. Ltd.,Company Ltd., New Delhi, 1992.
6. Mikell P.Groover - Automation , Production Systems and Computer Integrated Manufacturing, Second edition, Prentice Hall of India, 2002.
7. S.Kant Vajpayee - Principles of Computer Integrated Manufacturing, Prentice Hall of India, 1999.
8. David Bed worth - Computer Integrated Design and Manufacturing, TMH, 1998.

Online Resources:

1 NPTEL Lecture Series:

- https://nptel.ac.in/courses/112/102/112102101/,
- https://nptel.ac.in/courses/112/104/112104031/

2 MIT OCW:

https://ocw.mit.edu/courses/mechanical-engineering/2-158j-computational-geometry-spring-2003/

Course Outcomes:

1. Creation of part drawings and 3D models using CAD techniques.

2. Generation of part programs for industrial components using CAM techniques.

3. Skills to program and operate CNC machines.

4. Ability to develop a product from conceptualization to reality

RKDF UNIVERSITY RANCHI

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	Project Management	MEH 604

Objective:

- To facilitate the understanding of project management principles and processes

Contents:

Module- I

Introduction: Introduction to Project Management, definitions, History of Project Management, project identifications, establishing a project, Project Life Cycle.

Module- II

Project Analysis: Facets of Project Analysis, Resource Allocation, Market Analysis, Technical Analysis, Economic and Ecological Analysis.

Module- III

Financial Analysis: Financial Estimates and Projections, Investment Criteria, Financing of Projects.

Module- IV

Network Methods in PM: Origin of Network Techniques, AON and AOA differentiation, CPM network, PERT network, Other network models.

Module- V

Optimisation in PM: Time and Cost trade-off in CPM, Crashing procedure, Scheduling when resources are limited.

Module- VI

Project Risk Management: Risk analysis, Work Breakdown Structure, Earned Value Management.

Course Outcomes:

At the end of the course, the student will be able to:

1. Understand the importance of projects and its phases.
2. Analyze projects from marketing, operational and financial perspectives.

3. Evaluate projects based on discount and non-discount methods.
4. Develop network diagrams for planning and execution of a given project.
5. Apply crashing procedures for time and cost optimization.

Text Books:

1. Prasanna Chandra, Project: A Planning Analysis, Tata McGraw Hill Book Company, New Delhi, 4th Edition, 2009.
2. Cleland, Gray and Laudon, Project Management, Tata McGraw Hill Book Company, New Delhi, 3rd Edition, 2007.
3. Jack R. Meredith., Samuel J. Jr. Mantel., Project Management - A Managerial Approach, John Wiley, 6th Edition, 2011.

RKDF UNIVERSITY RANCHI

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	**Operations Research**	**MEH 605**

Course Objectives :

This course enables the students:

(1) Formulate a real-world problem as a mathematical programming model

(2) Know the theoretical workings of the simplex method for linear programming and perform iterations of it

(3) Analyze the relationship between a linear program and its dual, including strong duality and complementary slackness

(4) Solve specialized linear programming problems like the transportation, assignment, sequencing, games theory, and queuing model problems

(5) The use of Operations Research approaches in solving real problems in industry; mathematical models for analysis of real problems in Operations Research.

Course Outcomes:

After completion of the course, the learners will be able to:

(1) Capability to recognize the importance and value of Operations Research and mathematical modeling.

(2) Ability to formulate a managerial decision problem into a mathematical model;

(3) Recognize Operations Research models and apply them to real-life problems;

(4) Use various approaches to solve a mathematical model for various practical problems in industry.

(5) Describe dynamic programming terminology.

Module-I

Introduction: Scope and limitations of O.R., Linear Programming: Mathematical formulation of the problem. Graphical solution and Simplex Method.

Module-II

Linear Programming: Big-M Method, Concept of duality, Dual simplex method.

Module-III

Transportation Model: Basic feasible solution by different methods, Finding optimal solutions, Degeneracy in transportation problems, Unbalanced transportation problems. Assignment Model: Balanced and unbalanced assignments,Assignment to given schedules.

Module-IV

Sequencing: Processing of 2 jobs through machines –graphical method, Processing of n jobs through two machines, processing n jobs through three machines.

Module-V

Games Theory: Two-persons zero sum games, Pure and mixed strategies, Rules of dominance, Solution methods without saddle point.

Module-VI

Queuing Model: Queuing systems and their characteristics, The M/M/1/FIFO/ system, Introduction to dynamic programming.

Text Books:

1. P. Rama Murthy , Operations Research, New Age, New Delhi
2. P.K. Gupta & D. S. Hira , Operations Research, S. Chand & Company Ltd, New Delhi.

References Books:

1. Hamdy A Taha, 1999. Introduction to Operations Research, PHI Limited, New Delhi.
2. Sharma, J.K., 1989. Mathematical Models in Operations Research, Tata McGraw Hill publishing Company Ltd., New Delhi.
3. Beer, Stafford, 1966. Decision and Control, John Wiley & Sons, Inc., New York.

RKDF UNIVERSITY RANCHI

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	**Managerial Economics**	**MEH 606**

Course Objectives This course enables the students:

A. To explain the basics of economics and describe its application in managerial problems.

B. To demonstrate the effect of demand and cost on business decisions and make a relation between cost and production.

C. To analyse different types of market and explain pricing decisions in the markets.

D. To familiarize the concept of investment criteria. .

E To explain the concept of national income and analyse for managerial decisions.

Course Outcomes After the completion of this course, students will be:

1. Analyse economic problems and can corelate scarcity with the requirements.
2. Evaluate demand and can analyse cost in order to optimise cost-production combination.
3. Recognise the existing market and can take appropriate decisions. 4. Evaluate the investment criteria and can frame appropriate plan.
5. Analyse national income components for effective economic decisions.

Module 1

Introduction: Nature and scope, Definitions, Importance, Application to Business Decisions, Profit Maximization as Business Objectives, Sales and Revenue Maximization Objective of Business Firms.

Module2

Demand and Supply Introduction, Determinants of Demand and Supply, Demand Function, Demand and Supply Curves, Law of Demand, Elasticity of Demand, Demand Forecasting,

Module3

Production Analysis and Cost Classification of Cost, Cost-Output Relationship, Economies of Scale, Break-even Analysis Production Process and Function-One Variable and Two Variable Inputs, Iso-quant and Iso-cost, Optimal Factor Combination.

Module4

Market Introduction, Market Types- Perfect Competition, Imperfect Competition, Monopoly and Oligopoly- Price Leadership Model, Collusive Oligopoly and Kinked Demand Curve Model, Equilibrium of a Firm under Perfect Competition, Price Determination under Different Markets

Module5

Capital Budgeting & National Income Introduction, Meaning and Significance of Capital Budgeting, Methods of Investment Appraisal, Concept of National Income, Measurement of National Income- Methods and Problems.

Text Books

1. Managerial Economics, Atmanand, Excel Books

2. Managerial Economics, H. Craig Petersen & W. Cris Lewis, Pearson Education

RKDF UNIVERSITY RANCHI

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	**Remote Sensing & GIS**	**CEOE 607**

COURSE OBJECTIVES:

1. Apply the concepts of Photogrametry and its applications such as determination of heights of objects on terrain.
2. Understand the basic concept of Remote Sensing and know about different types of satellite and sensors.
3. Understand different components of GIS and Learning about map projection and coordinate system
4. Develop knowledge on conversion of data from analogue to digital and working with GIS software.

Module I

Remote Sensing: Definition and Development; Platformsand Types; Photogrammetry.

Module II

Satellite Remote Sensing: Principles, EMR Interaction with Atmosphere and Earth Surface; Satellites (Landsat and IRS); Sensors

Module III

Geographical Information System (GIS): Definition and Components.

Module IV

Global Positioning System (GPS) – Principles and Uses; DGPS.

Module V

GIS Data Structures: Types (spatial and Non-spatial), Raster andVector Data Structure.

References:-

1. Bhatta , B. (2008) Remote Sensing and GIS, Oxford University Press, NewDelhi.
2. Campbell J. B., 2007: Introduction to Remote Sensing, Guildford Press
3. Jensen, J. R. (2005) Introductory Digital Image Processing: A RemoteSensing.

4. Bhatta, B. (2010) Analysis of Urban Growth and Sprawl from Remote Sensing,Springer, Berlin Heidelberg.41

COURSE OUTCOMES: After completing this course the student will have acquired the ability on the following.

1. Understand the concepts of Photogrammetry and compute the heights of objects
2. Understand the principles of aerial and satellite remote sensing, Able to comprehend the energy interactions with earth surfacefeatures, spectral properties of water bodies .
3. Understand the basic concept of GIS and its applications, know different types of data representation in GIS
4. Understand and Develop models for GIS spatial Analysis and will be able to know what the questions that GIS can answer are
5. Apply knowledge of GIS software and able to work with GIS software in various application fields

Books/ Reference

1. Bhatta, B. (2008) Remote Sensing and GIS, Oxford University Press, New Delhi. 2. Campbell J. B., 2007: Introduction to Remote Sensing, Guildford Press 3. Jensen, J. R. (2005) Introductory Digital Image Processing: A Remote Sensing. 4. Bhatta, B. (2010) Analysis of Urban Growth and Sprawl from Remote Sensing, Springer, Berlin

RKDF UNIVERSITY RANCHI

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	PLC & SCADA	EEEO 608

COURSE OBJECTIVES:

To get familiar with industrial automation working with PLC and SCADA

Module I

Programmable Logic Controllers: Introduction, Parts of a PLC, Principles of Operation, Modifying the Operation, PLCs versus Computers, PLC Size and Application. PLC Hardware Components: The I/O Section, Discrete I/O Modules, Analog I/O Modules, Special I/O Modules, I/O Specifications, The Central Processing Unit (CPU), Memory Design, Memory Types, Programming Terminal Devices, Recording and Retrieving Data, Human Machine Interfaces (HMIs). Basics of PLC Programming: Processor Memory Organization, Program Scan, PLC Programming Languages, Relay-Type Instructions, Instruction Addressing, Branch Instructions, Internal Relay Instructions, Programming Examine If Closed and Examine If Open Instructions, Entering the Ladder Diagram, Modes of operation

Module II

Developing Fundamental PLC Wiring Diagrams and Ladder Logic Programs: Electromagnetic Control Relays, Contactors, Motor Starters, Manually Operated Switches, Mechanically Operated Switches, Sensors, Output Control Devices, Seal-in Circuits, Latching Relays, Converting Relay Schematics into PLC Ladder Programs, Writing a Ladder Logic Program Directly from a Narrative Description. Programming Timers: Mechanical Timing Relays, Timer Instructions, On-Delay Timer Instruction, Off-Delay Timer Instruction, Retentive Timer, Cascading Timers.

Module III

SCADA Fundamentals: Introduction, Open system: Need and advantages, Building blocks of SCADA systems, Remote terminal unit (RTU): Evolution of RTUs, Components of RTU, Communication subsystem, Logic subsystem, Termination subsystem,

Module IV Human-Machine Interface (HMI): HMI components, HMI software functionalities, Situational awareness, Intelligent alarm filtering: Need and technique, Alarm suppression techniques, Operator needs and requirements. SCADA Systems: Building the SCADA systems, legacy, hybrid, and new systems, Classification of SCADA systems, SCADA implementation: A laboratory model: The SCADA laboratory, System hardware, System software, SCADA lab field design.

Text Books:

1. Programmable Logic Controllers Frank D Petruzella McGraw Hill 4th Edition, 2011

2. Power System SCADA and Smart Grids Mini S. Thomas CRC Press 3rd Edition,2015

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BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. CSE	**Soft Computing**	CSO 609

Module I

FUZZY SET THEORY Introduction to Neuro – Fuzzy and Soft Computing – Fuzzy Sets – Basic Definition and Terminology– Settheoretic Operations – Member Function Formulation and Parameterization – Fuzzy Rules and Fuzzy Reasoning –Fuzzy Inference Systems – Input Space Partitioning and Fuzzy Modeling.

Module II

OPTIMIZATION Derivative-based Optimization – Descent Methods – The Method of Steepest Descent – Classical Newton's Method – Step Size Determination – Derivative-free Optimization

– Genetic Algorithms – Simulated Annealing – Random Search – Downhill Simplex Search.

Module III

NEURAL NETWORKS Supervised Learning Neural Networks – Perceptrons - Adaline – Backpropagation Mutilayer Perceptrons – Radial Basis Function Networks – Unsupervised Learning Neural Networks – Competitive Learning Networks – Kohonen Self-Organizing Networks – Learning Vector Quantization – Hebbian Learning.

Module IV

NEURO FUZZY MODELING AND OTHER TECHNIQUES Adaptive Neuro-Fuzzy Inference Systems – Architecture – Support Vector Machines – Independent Component Analysis.

Module V

APPLICATIONS OF COMPUTATIONAL INTELLIGENCE Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency Prediction – Soft Computing for Color Recipe Prediction.

TEXT BOOK :

1. J.S.R. Jang, C.T. Sun and E. Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004, Pearson Education 2004.

REFERENCES:

1. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill, 1997.
2. Davis E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.
3. S. Rajasekaran and G.A.V. Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003.
4. R. Eberhart, P. Simpson and R. Dobbins, "Computational Intelligence - PC Tools", AP Professional, Boston, 1996.

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BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	**Renewable Energy Engineering**	**MEL610**

Objectives:

1. To acquire knowledge of technical competency combined with research to generate innovative solutions in Energy engineering.
2. To be acquainted with a variety of options in energy sources.
3. To prepare the students to exhibit a high level of professionalism, integrity, environmental and social responsibility, and life-long independent learning ability with environment in mind.

Contents

Module I

Introduction: Basic concepts of energy; Introduction to Renewable Energy Technologies; Energy and Environment – global warming, acid rains, depletion of ozone layer; Global and Indian Scenario of renewable energy sources; Energy storage - necessity and energy storage methods.

Module II

Solar Energy: Fundamentals; Solar Radiation; Estimation of solar radiation on horizontal and inclined surfaces; Measurement of solar radiation data.

Solar Thermal Systems: Introduction; Basics of thermodynamics and heat transfer; Flat plate collector; Evacuated Tubular Collector; Solar air collector; Solar concentrator; Solar distillation; Solar cooker; Solar refrigeration and air conditioning; Thermal energy storage systems.

Solar Photovoltaic Systems: Introduction; Solar cell Fundamentals; Characteristics and classification; Solar cell: Module, panel and Array construction; Photovoltaic thermal systems.

Module III

Wind Energy: Introduction; Origin and nature of winds; Wind turbine siting; Basics of fluid mechanics; Wind turbine aerodynamics; wind turbine types and their construction; Wind energy conversion systems.

Biomass Energy: Introduction; Photosynthesis Process; Biofuels; Biomass Resources; Biomass

conversion technologies; Urban waste to energy conversion; Biomass gasification.

Other forms of Energy: Introduction: Nuclear, ocean and geothermal energy applications; Origin and their types; Working principles.

Text /Reference Books:

1. O.P. Gupta, "Energy Technology", Khanna Book Publishing, New Delhi.
2. V.V.N. Kishore, "Renewable Energy Engineering and Technology: Principles and Practice," Routledge, 1st Edition, 2019.
3. N. Jenkins and J. Ekanayake, "Renewable Energy Engineering," Cambridge University Press, 1st Edition, 2017.
4. G. Boyle, "Renewable Energy," OUP Oxford, 2nd Edition, 2009.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc22_ph44/preview
2. https://onlinecourses.swayam2.ac.in/nou22_ge71/preview

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Acquire, apply and share in depth knowledge in the area of Energy Engineering and Management.
2. An ability to apply engineering and scientific principles for the effective management of energy systems.

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BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	**Computational Fluid Dynamics**	**MEL611**

Course Objectives

The primary objective of the course is to introduce the basic aspect of numerical approach of flow problems. It would cover issues like representation of mathematical formula; classification of flow problem; approximating it and its stability analysis.

Module –I

Governing equations; conservative and non-conservative forms of equations; modelsof flow.

Module –II

Mathematical classification of Partial differential equations; Elliptic, Parabolic and hyperbolic equations; linear and non-linear PDE; initial and boundary conditions.

Module – III

Basic aspects of discretization: finite difference approximations by forward, backward and central differencing up to fourth order accuracy.

Module – IV

Consistency analysis; linearization; Explicit and Implicit Schemes, Error analysis.

Module –V

Stability Analysis: Discrete Perturbation Stability Analysis; Von-Newmann Stability Analysis, Case study on Lid Driven Cavity problem.

Textbooks:

1. Computational Fluid Dynamics – The Basics with Applications (J. D. Anderson Jr.)
2. Computational Fluid Dynamics (J. D. Anderson)

Reference books

1. Computational Fluid Dynamics – Principles and Applications (J. Blazek)
2. Numerical Computation of Internal and External Flows (C. Hirsch)

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BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	**Additive Manufacturing**	**MEL 612**

Objectives:

To provide an overview of Additive Manufacturing processes, systems and applications.

Contents:

Module I

Introduction to Additive Manufacturing (AM): Evolution of AM/3D printing; Comparison with subtractive and forming processes; Advantages of AM; Classification of AM processes; Key steps in AM.

Module II

Liquid State-based AM Processes: Stereo lithography – Process and working principle; Photopolymers; Photo polymerization, layering technology, Laser and Laser scanning; Micro-stereolithography; Equipment and specifications; Applications, advantages, disadvantages, examples; Solid ground curing: Process, Working principle; Equipment and specifications; Applications, advantages, disadvantages, examples.

Module III

Solid State-based AM Processes: Fused Deposition Modeling – Process, working principle and materials; Equipment and specifications; Laminated object manufacturing – Process and working principle; Equipment and specifications; Applications, advantages, disadvantages, examples; Other solid-state processes – Ultrasonic consolidation, Gluing, Thermal bonding; Demonstration of equipment.

Module IV

Powder Based AM Processes: Powder Bed Fusion Processes – Working principle and materials; Powder fusion mechanism and powder handling; Various LBF processes (principle, materials, applications and examples) – Selective laser Sintering, Electron Beam Melting, Laser Engineered

Net Shaping, Binder Jetting and Direct Metal Deposition; Comparison between LBF processes; Materials-process-structure-property relationships; relative advantages and limitations.

Module V

Applications of AM: Product development lifecycle applications – Rapid prototyping, concept models, visualization aids, replacement parts, tooling, jigs and fixtures, moulds and casting; Application sectors – aerospace, automobile, medical, jewelry, sports, electronics, food, architecture, construction and others.

Text /Reference Books:

1. Sabrie Soloman, 3D Printing & Design, Khanna Book Publishing Company, New Delhi, 2020.
2. Ian Gibson, David W Rosen, Brent Stucker, "Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping and Direct Digital Manufacturing", Springer, 2015
3. Chua Chee Kai, Leong Kah Fai, "3D Printing and Additive Manufacturing: Principles & Applications," World Scientific, 2015.
4. C.P Paul, A.N Junoop, "Additive Manufacturing: Principles, Technologies and Applications," McGraw Hill, 2021.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc21_me115/preview
2. https://onlinecourses.nptel.ac.in/noc20_mg70/preview

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Understand the overall principle and various processes for additive manufacturing.
2. Select a particular additive manufacturing process based on the end application.
3. Plan the steps in fabricating a given part using additive manufacturing.

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BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	Introduction to Soft Skills	ME654

Soft skill development

Module-I: Speaking skill

Module-II: Introduction to Group discussion

Module-III: Process of Group Discussion

Module-IV: Leadership skill

Module-V: Instant public speaking

Suggested books:

1. Contemporary English Grammar Structures and Composition; David Green, Macmillan
2. English Grammar and composition; R. C. Jain, Macmillan
3. Effective Technical Communication; M. Ashraf Rizvi, Tata McGraw Hill Companies
4. Developing Communication Skills; Krushna Mohan, Meera Baneji, Macmillan

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BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	Mechatronics, Robotics & Control	MEP701

Objectives:

1. Model and analyze mechatronic systems for an engineering application
2. Identify sensors, transducers and actuators to monitor and control a process or product.
3. Develop PLC programs for an engineering application.
4. Evaluate the performance of mechatronic systems.

Contents

Module I

Introduction: Electro-mechanical systems; Typical applications; Examples – automobiles, home appliances, medical instruments, etc.

Module II

Sensors: Transduction principles; Sensitivity, accuracy, range, resolution, noise sources; Sensors for common engineering measurements – proximity, force, velocity, temperature, etc.; Signal processing and conditioning; Selection of sensors.

Module III

Actuators: Pneumatic and hydraulic actuators; Electric motors including DC, AC, BLDC, servo and stepper motors; Solenoids and relays; Active materials – piezoelectric and shape memory alloys.

Module IV

Machine Controls: Microprocessors and their architecture; Memory and peripheral interfacing; Programming; Microcontrollers; Programmable Logic Controllers; PLC principle and operation; Analog and digital input/output modules; Memory module; Timers, internal relays, counters and data handling; Industrial automation systems; Basic PLC programming; Industry kits (Arduino, Raspberry Pi, etc.).

Module V

Robotics: Robot configurations: serial and parallel; Denavit–Hartenberg parameters; Manipulators kinematics; Rotation matrix, Homogenous transformation matrix; Direct and inverse Kinematics for robot position and orientation; Workspace estimation and path planning; Robot vision; Motion tracking; Robot programming and control; Industrial robots - Pick and place robots, sorting, assembly, welding, inspection, etc.

Module VI

Control Theory and Systems: Basic control concepts; Feedback; Open and closed loop control; Concept of block diagrams; P, PI and PID controllers; Tuning the gain of controllers; System models, transfer functions, system response, frequency response; Root Locus method and Bode plots.

Module VII

Computational Tools: Demonstration and projects using simulation software (e.g., Matlab, Scilab, ROBODK) for control systems and robotics.

Text /Reference Books:

1. W. Bolton, "Mechatronics," Addison Wesley Longman, 2010.
2. J. J. Craig, Introduction to Robotics Mechanics and Control, Addison Wesley, 1999.
3. G.K. McMillan, "Process/Industrial Instruments and Controls Handbook," McGraw-Hill, 1999.
4. S. Mukherjee, "Essentials of Robotics Process Automation", Khanna Book Publishing, 2021.

Online Resources:

1. https://nptel.ac.in/courses/107/106/107106090/
2. https://nptel.ac.in/courses/112/101/112101098/
3. https://nptel.ac.in/courses/112/107/112107289/
4. https://nptel.ac.in/courses/112/104/112104298/

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Ability to recognize and analyze electro-mechanical systems in daily lives.
2. Understand the role of sensors, actuators, and controls in mechatronic systems.
3. Understand the basic theory of robot kinematics.

4. Familiarity with control theory and controller design.
5. Understand the measurement of various quantities using instruments, their accuracy & range, and the techniques for controlling devices automatically.

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BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	Industrial Psychology	MEH702

Module-I

Introduction: The role of the psychologist in industry, the field of occupational Psychology: Study of behavior in work situation and applications of Psychological principles to problems of selection, Placement, Counseling and training

Module-II

Design of Work Environments: Human engineering and physical environment techniques of job analysis, Social environment: Group dynamics in Industry Personal psychology, Selection, training, placement, promotion, counseling, job motivations, job satisfaction. Special study of problem of fatigue, boredom and accidents

Module-III

Understanding Consumer Behavior: Consumer behaviour, study of consumer preference, effects of advertising, Industrial morale: The nature and scope of engineering psychology, its application to industry

Module-IV

Work Methods: Efficiency at work, the concept of efficiency, the work curve, its characteristics, the work methods; hours of work, nature of work, fatigue and boredom, rest pauses. The personal factors; age abilities, interest, job satisfaction, the working environment, noise, illumination, atmospheric conditions, increasing efficiency at work; improving the work methods, Time and motion study, its contribution and failure resistance to time and motion studies, need for allowances in time and motion study.

Module-V

Work and Equipment Design: Criteria in evaluation of job-related factor, job design, human factors, Engineering information, input processes, mediation processes, action processes, methods design, work space and its arrangement, human factors in job design. Accident and Safety: The

human and economic costs of accidents, accident record and statistics, the causes of accidents situational and individual factors related to accident reduction.

Suggested readings:

1. Tiffin, J and McCormic E.J., Industrial Psychology, Prentice Hall, 6th Edn., 1975.
2. McCormic E.J., Human Factors Engineering and Design, McGraw Hill, 4th Edn.,1976.
3. Mair, N.R.F., Principles of Human relations
4. Gilmer, Industrial Psychology
5. Ghiselli & Brown, Personnel and Industrial Psychology.
6. Myer, Industrial Psychology.
7. Dunnete, M.D., Handbook of Industrial and Organizational Psychology.
8. Blum & Taylor, Industrial Psychology

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BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	Product Innovation & Entrepreneurship	MEP703

Objectives: To expose aspiring student entrepreneurs to various elements of a technology venture starting from market need identification to innovative solution development and its commercialization through business planning and start-up company incubation.

Contents:

Module I

Entrepreneurship: Role of entrepreneurship in economic development; Entrepreneurial mindset, motivation and competencies; Market pull and technology push factors; New product development lifecycle; Technology readiness levels; Product-market fit validation; Commercialization pathways; Business vision & leadership; Team composition & management.

Module II

Product Innovation: Opportunity scanning, market survey, need identification and problem definition; Creative design thinking for concept generation; Detailed design & prototyping; Functionality & manufacturability; Bill of materials & components supply chain; Manufacturing & assembly plan; Product testing & quality assurance; Intellectual property rights management.

Module III

Marketing & Finance: Market segmentation & market sizing; Customer persona & value proposition; Marketing (Go-to-market) strategy; Distribution channels and sales network; Funding requirement (based on stage); Source of funding for startup ventures; Financial projections and accounting; Startup to scale up financing.

Module IV

Venture Creation: Sustainable business options & pathways; Business model & business canvas; Startup team & business partners; Startup ecosystem and stakeholders; Technology business incubators & parks; Proposal pitching & agreements; Startup company incorporation; Social impact & responsibility.

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Module V

Course Project: Need identification, innovative solution, business plan, go-to-market strategy.

Text /Reference Books:

1. Bill Aulet, “Technology Entrepreneurship”, 4th ed., Tata McGraw Hill, 2014.
2. Peter F. Drucker, “Innovation and Entrepreneurship”, 1st ed., Harper Business, 2006.
3. Chelat Bhuvanachandran, Innovision, Khanna Book Publishing, 2022.
4. Byers, Dorf, and Nelson, Technology Ventures: From Ideas to Enterprise, McGraw Hill, 2010
5. Steve Blank, “The Startup Owner's Manual”
6. T.V. Rao, “Entrepreneurship - A South Asian Perspective” Online Resources: 1 https://onlinecourses.nptel.ac.in/noc22_ge03/preview

Course Outcomes: At the end of this course students will demonstrate the ability to 1. Understand how to identify an unmet need through market research

2. Learn how to create an innovative solution and check problem-solution fit

3. Practice business planning, including marketing, fund-raising and start-up incubation.

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BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	Power Plant Engineering	MEL704

Course Objective:

- To introduce students to different aspects of power plant engineering.
- To familiarize the students to the working of power plants based on different fuels
- To expose the students to the principles of safety and environmental issues.

Module-I

Introduction Power and energy, sources of energy, review of thermodynamic cycles related to power plants, fuels and combustion calculations. Load estimation, load curves, various terms and factors involved in power plant calculations. Effect of variable load on power plant operation, Selection of power plant

Power plant economics and selection Effect of plant type on costs, rates, fixed elements, energy elements, customer elements and investor's profit; depreciation and replacement, theory of rates. Economics of plant selection, other considerations in plant selection.

Module-II

Steam power plant General layout of steam power plant, Power plant boilers including critical and super critical boilers. Fluidized bed boilers, boilers mountings and accessories, Different systems such as coal handling system, pulverizers and coal burners, combustion system, draft, ash handling system, Dust collection system, Feed water treatment and condenser and cooling towers and cooling ponds, Turbine auxiliary systems such as governing, feed heating, reheating , flange heating and gland leakage. Operation and maintenance of steam power plant, heat balance and efficiency, Site selection of a steam power plant.

Module-III

Diesel power plant General layout, Components of Diesel power plant, Performance of diesel power plant, fuel system, lubrication system, air intake and admission system, supercharging system, exhaust system, diesel plant operation and efficiency, heat balance, Site selection of diesel

power plant, Comparative study of diesel power plant with steam power plant.

Gas turbine power plant Layout of gas turbine power plant, Elements of gas turbine power plants, Gas turbine fuels, cogeneration, auxiliary systems such as fuel, controls and lubrication, operation and maintenance, Combined cycle power plants, Site selection of gas turbine power plant

Module-IV

Nuclear power plant Principles of nuclear energy, Lay out of nuclear power plant, Basic components of nuclear reactions, nuclear power station, Nuclear waste disposal, Site selection of nuclear power plants. Hydro electric station Hydrology, Principles of working, applications, site selection, classification and arrangements, hydro-electric plants, run off size of plant and choice of units, operation and maintenance, hydro systems, interconnected systems. Non Conventional Power Plants Introduction to non-conventional power plants (Solar, wind, geothermal, tidal) etc.

Module-V

Electrical system Generators and generator cooling, transformers and their cooling, bus bar, etc. Instrumentation Purpose, classification, selection and application, recorders and their use, listing of various control rooms. Pollution due to power generation.

References

1. "Power Plant Engineering" F.T. Morse, Affiliated East-West Press Pvt. Ltd, New Delhi/Madras.
2. Power Plant Engineering" Mahesh Verma, Metropolitan Book Company Pvt. Ltd. New Delhi
3. "Power Plant Technology" El-Vakil, McGraw Hill.
4. Power Plant Engineering by P.K. Nag, Tata McGraw Hill.
5. Steam & Gas Turbines & Power Plant Engineering by R.Yadav, Central Pub.House.

Course Outcomes:

1. At the end of the course, a student will be able to:
2. Describe and analyze different types of sources and mathematical expressions related to thermodynamics and various terms and factors involved with power plant operation.
3. Analyze the working and layout of steam power plants and the different systems comprising the plantand discuss about its economic and safety impacts
4. Combine concepts of previously learnt courses to define the working principle of diesel power plant,its layout, safety principles and compare it with plants of other types.

5. Describe the working principle and basic components of the nuclear power plant and the economicand safety principles involved with it.
6. Discuss the working principle and basic components of the hydro electric plants and the economicprinciples and safety precautions involved with it.
7. Discuss and analyze the mathematical and working principles of different electrical equipments involved in the generation of power.

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BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	ADVANCE WORKSHOP PRACTISE	MEL705

Objective:

Workshop Technology is the backbone of the real industrial environment which helps to develop and enhance relevant technical hand skills required by the technician working in the various engineering industries and workshops.

Module-I

Lathe: Classification of machine tools and their basic components; lathe- specification, components & accessories, various operations on lathes, capstan & turret lathes, tool layout, methods of thread production, machining time, single point cutting tools, tool signature and nomenclature

Module-II

Grinding: Types of grinding machines, surface, cylindrical and internal grinding, grinding wheels, specifications, wheel turning and dressing without eccentricity, centre-less grinding.

Module-III

Milling: Vertical, horizontal and universal type machines, specifications and classifications of milling machines, universal dividing head plain and different indexing, gear cutting, milling cutters.
Drilling & Broaching: Fixed spindle, radial and universal drilling machines, drilling time, broaching principle, broaches and broaching machines.

Module-IV

Shapers: Classification and specifications, principle parts, quick return mechanism, shaper operations, speed feed, depth of cut, machining time. Surface qualities, equipment used for rating surfaces, rms. CLA value, causes for surface irregularities.

Gear Cutting: Die casting, methods of forming gears, generating process, Gear shaping, gear shaving, gear grinding gear testing.

Module-V

Mechatronics: Introduction to control systems, analog control, transfer function, procedure for writing transfer function, signal flow diagram, introduction to electronic components like switches, magnetic type, electromagnetic type, transducers and other sensors, servo motors, basics of CD-ROM players, PLC, applications, CNC machines.

Course Outcome:

Upon completion of this laboratory course, students will be able to

1. Fabricate components with their own hands.
2. Get practical knowledge of the dimensional accuracies and tolerances applicable for different manufacturing processes.
3. Produce small devices of their interest for project or research purpose.

References:

1. Rao PN; Manufacturing Technology vol I and II; TMH
2. Hazra Chadhary; Workshop Tech.II; Media Promoter and Pub
3. Lindberg RA; Processes and Materials of Manufacturing; PHI.
4. Raghuvanshi;BS; Work shop technology Vol-I, II; Dhanpat Rai Delhi
5. Alciatori DG, Histand MB; Introduction to Mechatronics and Measurement system;TMH
6. HMT; Production Processes; TMH.

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BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	Mechanical Vibration	MEL706

Course Objectives

1. To conversant with balancing problems of machines.
2. To understand fundamentals of free and forced vibrations.
3. To develop competency in understanding of vibration and noise in Industry.
4. To develop analytical competency in solving vibration problems.
5. To understand the various techniques of measurement and control of vibration and noise.

Module-I

Basic Concepts of Vibration : Vibration and oscillation, causes and effects of vibrations, Vibration parameters – spring, mass, damper, Damper models, Motion – periodic, non periodic, harmonic, non- harmonic, Degree of freedom, static equilibrium position, Vibration classification, Steps involved in vibration analysis. Free Undamped Single Degree of Freedom Vibration System : Longitudinal, transverse, tensioned system, Methods for formulation of differential equations by Newton, Energy, Lagrangian (Rayleigh's Method), Effect of springs mass and shaft inertia on natural frequency, Effect of flexible bearing on natural frequency.

Module-II

Free Damped Single Degree of Freedom Vibration System : Viscous damped system – under damped, critically damped, over damped; Logarithmic decrement; Coulomb's damping; Combined viscous and coulomb's damping. Equivalent Single Degree of Freedom Vibration System : Conversion of multi- springs, multi masses, multi – dampers into a single spring and damper with linear or rotational coordinate system

Module-III

Free Undamped Multi Degree of Freedom Vibration System : Eigen values and Eigen vectors for linear system and torsional two degree of freedom; Holzer method for linear and torsional unbranched system; Two rotors, Three rotors and geared system; Dunkerley and Rayleigh method for transverse vibratory system Forced Single Degree of Freedom Vibratory System : Analysis of

linear and torsional systems subjected to harmonic force excitation and harmonic motion excitation (excluding elastic damper)

Module-IV

Vibration Measuring Instruments : Principle of seismic instruments, vibrometer, accelerometer−undamped, damped. Vibration Isolation : Force isolation, motion isolation, isolators. . Rotor Dynamics : Critical speed of single rotor, undamped and dampedCAM Dynamics : Cam Dynamics: Mathematical Model, Differential Equation, Response Follower Jump Phenomenon

Module-V

Balancing : Static and dynamic balancing of multi rotor system, Balancing of reciprocating masses In – line engines, V – engines (excluding radial engines)

Course Outcomes:

On completion of the course, students will be able to –

1) Apply balancing technique for static and dynamic balancing of multi cylinder inline and radial engines.

2) Estimate natural frequency for single DOF undamped & damped free vibratory systems. Determine response to forced vibrations due to harmonic excitation, base excitation and excitation due to unbalance forces.

3) Estimate natural frequencies, mode shapes for 2 DOF undamped free longitudinal and tensional vibratory systems.

4) Describe vibration measuring instruments for industrial / real life applications along with suitable method for vibration control.

5) Explain noise, its measurement & noise reduction techniques for industry and day today life problems

Reference :

1. Mechanical Vibrations (S.S. Rao) Pearson Education (4th Edition).
2. Mechanical Vibrations (G.K. Grover).
3. Fundamentals of Mechanical Vibration (S. graham Kelly) Tata McGraw Hill.
4. Mechanical Vibration Analysis (P. srineevasan) Tata McGraw Hill.
5. Mechanical Vibrations − Schaum's Ouline Series (S. Graham Kelly) McGraw Hill.

6. Mechanical Vibrations− Schaum's Ouline Series (William W. Seto) McGraw Hill.
7. Theory and Practice of Mechanical Vibrations (J.S. Rao, K. Gupta) New Age International

Publications.

1. Mechanical Vibrations (Den, Chambil, Hinckle).
2. Mechanical Vibrations (J.P. Den Hartog) McGraw Hill Book Company Inc.
3. Introduction to Dynamics and Control (Leonard Meirovitch) Wiley − New york.
4. Elements of Vibration Analysis (Leonard Meirovitch) McGraw Hill − New York..
5. Dynamics and Control of Structures (Leonard Meirovitch) Wiley − New York.
6. Matrices and Transformations (Antoy J. Pettofrezzo) Oxford University Pre

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BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	Refrigeration & Air Conditioning	MEL707

Course Objectives:

1. To understand the concept of refrigeration
2. To acquire knowledge of methods of refrigeration
3. To acquire knowledge of Air refrigeration system
4. To acquire knowledge of vapour compression and vapour absorption refrigerationsystem.
5. To acquire knowledge of refrigerants

Module-I

Introduction: Principles and methods of refrigeration, freezing; mixture cooling by gas reversible expansion, throttling, evaporation, Joule Thomson effect and reverse Carnot cycle; unit of refrigeration, coefficient of performance, vortex tube & thermoelectric refrigeration, adiabatic demagnetization; air refrigeration cycles- Joule's cycle Boot-strap cycle, reduced ambient cycle and regenerative cooling cycles.

Module-II

Vapour compression system: Vapor compression cycle, p-h and t-s diagrams, deviations from theoretical cycle, sub-cooling and super heating, effects of condenser and evaporator pressure on cop; multi-pressure system: removal of flash gas, multiple expansion & compression with flash inter cooling; low temperature refrigeration: production of low temperatures, cascade system, dry ice, production of dry ice, air liquefaction system,.

Module-III

(a) **Vapour absorption system**: Theoretical and practical systems such as aqua-ammonia, electrolux&othersystems;

(b)**Steam jet refrigeration**: Principles and working, simple cycle of operation, description and working of simplesystem,

(c)**refrigerants:** nomenclature & classification, desirable properties, common refrigeration, comparative study, leak detection methods, environment friendly refrigerants and refrigerant mixtures, brine and its properties

Module-IV

Psychrometric: Calculation of psychrometric properties of air by table and charts; psychrometric processes: sensible heating and cooling, evaporative cooling, cooling and dehumidification, heating and humidification, mixing of air stream, sensible heat factor; principle of air conditioning, requirements of comfort air conditioning, ventilation standards, infiltrated air load, fresh air load human comfort, effective temperature & chart, heat production & regulation of human body,

Module-V

Air conditioning loads: calculation of summer & winter air conditioning load, bypass factor of coil, calculation of supply air rate & its condition, room sensible heat factor, grand sensible heat factor, effective sensible heat factor, dehumidified air quantity. Problems on cooling load calculation. Air distribution and ventilation systems.

Course Outcomes:

At the end of the course the student will be able to :

A. Describe the concept of refrigeration and its unit.
B. Describe different methods of refrigeration.
C. Explain air refrigeration cycle and its application in air craft.
D. Explain vapour compression refrigeration system
E. Explain vapour absorption refrigeration system
F. Explain properties of refrigerants

References:

1. Arora CP; Refrigeration and Air Conditioning; TMH
2. Sapali SN; Refrigeration and Air Conditioning; PHI
3. Ananthanarayan; Basic Refrigeration and Air conditioning; TMH
4. Manohar Prasad; Refrigeration and Air Conditioning; New Age Pub
5. Ameen; Refrigeration and Air Conditioning; PHI
6. Pita ; Air conditioning Principles and systems: an energy approach; PHI
7. Stoecker W.F, Jones J; Refrigeration and Air conditioning; McGH, Singapore

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BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	Automobile Engineering	MEL708

Course Objectives:

To understand & apply the knowledge about various system, subsystems & their interrelationships of theautomobile for the manufacturing of advanced automotive techniques

Course Outcomes:

A. Know the different types of automobiles, basic structure of automobile and their manufacturers inIndia. Understand the basic engine system working R/U/A 2 10

B. Understand the transmission of power in automobile R/U/A 2 10

C. Familiarize with fuel supply to automobile and understand the cooling system R/U/A 2 08

D. Explain the steering and braking system employed in automobiles R/U/A 2 08

E. Explain the different suspension system of an automobile and selection of tyre for an automobile R/U/A 2 10

F. Explain the Electrical and ignition system employed in Automobile

Module-I

VEHICLE STRUCTURE AND ENGINES Types of automobiles , vehicle construction and different layouts ,chassis, frame and body, resistances to vehicle motion and need for a gearbox, components of engine-their forms ,functions and materials

Module-II

ENGINE AUXILIARY SYSTEMS Electronically controlled gasoline injection system for SI engines., Electronically controlled diesel injection system (Unit injector system, Rotary distributor type and common rail direct injection system), Electronic ignition system, Turbo chargers, Engine emission control by three way catalytic converter system.

Module-III

TRANSMISSION SYSYTEMS Clutch-types and construction ,gear boxes- manual and automatic, gear shift mechanisms, Over drive, transfer box, fluid flywheel –torque converter , propeller shaft,

slip joints, universal joints ,Differential, and rear axle, Hotchkiss Drive and Torque Tube Drive.

Module-IV

STEERING, BRAKES AND SUSPENSION SYSTEMS: Steering geometry and types of steering gear Box-Power Steering, Types of Front Axle, Types of Suspension Systems, Pneumatic and Hydraulic Braking Systems, Antilock Braking System and Traction Control

Module-V

ELECTRICAL AND CONTROL SYSTEMS : Storage battery, construction and operation of lead acid battery, testing of battery, principle of operation of starting mechanism, different drive systems, starter relay switch, regulator electric fuel gauge, fuel pump, horn, wiper, Lighting system, head light dazzling, signaling devices, battery operated vehicles, choppers. importance of maintenance, scheduled and unscheduled maintenance, wheel alignment, trouble Shooting probable causes & remedies of various systems, microprocessor based control system for automobile, intelligent automobile control systems.

Text /Reference Books:

1. A.K. Babu, S.C. Sharma, Automobile Mechanics, Khanna Book Publishing, 2019.
2. A.K. Babu, S.C. Sharma, Automobile Engines, Khanna Book Publishing, 2019.
3. Kirpal Singh, Automobile Engineering, 7th ed., Standard Publishers, New Delhi, 1997.
4. Jain K.K. and Asthana R.B., Automobile Engineering, Tata McGraw Hill, New Delhi, 2002.
5. Heitner J., Automotive Mechanics, 2nd ed., East-West Press, 1999.
6. Heisler H., Advanced Engine Technology, SAE International Publ., USA, 1998.

Online Resources:

1. https://archive.nptel.ac.in/courses/107/106/107106088/

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BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	Industrial Tribology	MEL 709

Course Objectives

This course enables the students to:

1.Understand basic principles of tribology and its role in engineering.

2.Apply concepts of wear, friction and lubrication for industrial significance and economicaspects.

3.Understand in detail necessity of tribology and lubrication in real world.

Course Outcomes

After the completion of this course, students will be able to:

1.Describe role of tribology in engineering.

2.Analysis of contact surfaces phenomenon and friction.

3.Identify wear type and quantification.

4.Describe and understand lubrication mechanisms.

5.Implement industrial applications of tribology and lubrication.

Module -I

Tribology

Introduction of tribology, nature of engineering surfaces, Role of tribology in MEMS/NEMS, factors influencing tribological phenomena. Engineering surfaces- Surface characterization, Computation of surface parameters, Surface measurement techniques, Introduction to micro and nano tribology, Industrial significance and economic aspects.

Module –II

Contact of engineering surfaces

Hertzian and non-hertzian contact. Contact pressure and deformation in non- conformal contacts, Genesis of friction, friction in contacting rough surfaces, sliding and rolling friction, various laws and theory of friction. Atomic scale understanding of friction, Surface forces (van der Waals, electrostatic, hydrogen bonding etc.), stick-slip phenomenon, friction anisotropy.

Module – III

Wear

Wear and wear types, Mechanisms of wear - Adhesive, abrasive, corrosive, erosion, fatigue, fretting, etc., Wear of metals and non-metals. Wear models - asperity contact, constant and variable wear rate, geometrical influence in wear models, wear damage, wear controlling techniques.

Module - IV

Lubrication

Lubricant composition, lubricant types, physical and chemical properties, effect of temperature and pressure on viscosity, additive role and types, elements of lubrication, Lubrication regimes- Boundary Lubrication, Mixed Lubrication, Hydrodynamic lubrication.

Module –V

Industrial applications

Solution of tribological problems and recent developments, an overview of engineering materials having potential for tribological application, rolling element bearings, gears, crank shafts, piston rings, cylinder liners etc.

Textbooks

1. M. Hutchings, Tribology: Friction and Wear of Engineering Materials, Edward Arnold, 1992.
2. K. C. Ludema, Friction, Wear, Lubrication: A Textbook in Tribology, CRC Press, 1996.
3. R. D. Arnell, P. Davies, J. Halling, and T. Whomes, Tribology Principles and Design Applications,MacMillan, 1991.

Reference Books

1. G Bayer, Mechanical wear prediction and prevention- Marcel Dekkar. Inc., New York.
2. B. Bhushan, Principles and Applications of Tribology, Willey –IEEE, 1999.
3. P. Sahoo. Industrial Tribology, Tata McGraw Hill.

Web links

1. www.tribology-abc.com
2. www.ltu.se/tfm/me
3. www.skf.com
4. www.statoillubricants.com
5. www.stle.org
6. www3.imperial.ac.uk/tribology

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BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	Auto CAD	CEO 710

Course Objectives: The objective of this lab is to teach the student usage of Auto cad and basic drawing fundamentals in various civil engineering applications, specially in building drawing.

Module I

Theory Introduction

Principle of drafting, Terminology, & fundamentals. Size & shape descriptions. Geometric Construction.

Module II

Views

Plan views, Auxiliary views, Section Views.

Projection , Method of Projection. Multi-view Orthographic Projection. Projection Techniques.

Module III

CADD

Introduction of CADD (Computer Aided Drafting & Designing). Function keys, Shortcut keys, Different sizes of paper. Application of CADD – Automatic Drafting , Geometric Modeling Geometric Modeling – Wire frame Modeling, Surface Modeling, and Solid Modeling. CADD Application & it's feature Introduction to Standard based 2D drafting (Based on International standardfor representation & conformation)

Practical Competencies

- Practice on Drawing basics
- Geometrical Drawing Practice
- Making plan of Projection.
- Creation Multi-view Orthographic projection.
- Drafting views in First angle & Third angle Projection.
- Creating Auxiliary views & Sections.
- Freehand Sketching.

- Representing Standard base 2D drafting.
- Drawing Elementary CADD command – Line, Polyline, Polygon, Circle, Polyline, arc, ellipse, Text Single Text, Multi text, D text.
- Modifying Elementary Commands – Erase, Move, Copy , Mirror, Offset, Scale, Stretch, Chamfer, fillet & explode.
- Making layers, line type &Lineweight.
- Different menus of Auto-Cad, Function keys, Shortcut keys, Paper size.
- Making Title Block, Writing it & inserting it in any drawing file with scale, angle & explode options.
- Creating a new template file (.Dwt file) & applying it to every drawing file.
- Drafting of building plan , Elevation , Section Views.

Course Outcomes: At the end of the course, the student will be able to:

1. Use the Autocad commands for drawing 2D & 3D building drawings required for different civil engg applications.
2. Plan and draw Civil Engineering Buildings as per aspect and orientation.
3. Presenting drawings as per user requirements and preparation of technical report

Book/References:

1. Computer Aided Design Laboratory by M. N. Sesha Praksh & Dr. G. S. Servesh –Laxmi Publications.
2. EngineeringGraphics by P. J. Sha – S. Chand & Co.

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BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	Wind & Solar Energy System	EEEO 711

Course Objectives:

Course Outcomes:

At the end of this course, students will demonstrate the ability to

1.Understand the energy scenario and the consequent growth of the power generation from renewable energy sources.

2.Understand the basic physics of wind and solar power generation.

3.Understand the power electronic interfaces for wind and solar generation.

4.Understand the issues related to the grid-integration of solar and wind energy systems.

Module I

Physics of Wind Power:

History of wind power, Indian and Global statistics, Wind physics, Betz limit, Tip speed ratio, stall and pitch control, Wind speed statistics-probability distributions, Wind speed and power-cumulative distribution functions.

Module II

Wind generator topologies:

Review of modern wind turbine technologies, Fixed and Variable speed wind turbines, Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent- Magnet Synchronous Generators, Power electronics converters. Generator - Converter configurations, Converter Control.

Module III

The Solar Resource:

Introduction, solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solar day length, Estimation of solar energy availability.

Module IV

Solar photovoltaic:

Technologies-Amorphous, monocrystalline, polycrystalline; V-I characteristics of a PV cell, PV

module, array, Power Electronic Converters for Solar Systems, Maximum Power Point Tracking (MPPT) algorithms. Converter Control.

Module V

Network Integration Issues:)

Overview of grid code technical requirements. Fault ride-through for wind farms - real and reactive power regulation, voltage and frequency operating limits, solar PV and wind farm behavior during grid disturbances. Power quality issues. Power system interconnection experiences in the world. Hybrid and isolated operations of solar PV and wind systems.

Technologies, Parabolic trough, central receivers, parabolic dish, Fresnel, solar pond, elementary analysis.

Text / References:

1. T. Ackermann,"Wind Power in Power Systems", John Wiley and SonsLtd.,2005.
2. G. M. Masters, "Renewable and Efficient Electric Power Systems**",** John Wiley and Sons, 2004.
3. S.P. Sukhatme,"Solar Energy: Principles of Thermal Collection and Storage", McGraw Hill,1984.
4. H. Siegfried and R. Waddington, "Grid integration of wind energy conversion systems" John Wiley and Sons Ltd., 2006.
5. G.N. Tiwariand M.K. Ghosal," Renewable Energy Applications",Narosa Publications,2004.
6. J. A. Duffie and W. A. Beckman, " Solar Engineering of Thermal Processes", John Wiley & Sons, 1991.

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BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Branch	Subject Title	Subject Code
B.Tech. ME	**Artificial Intelligence (AI)**	CSO 712

Module I

Introduction: Overview of Artificial Intelligence- Problems of AI, AI Technique, Tic - Tac - Toe Problem. Intelligent Agents: Agents & Environment, Nature Of Environment, Structure Of Agents, Goal Based Agents, Utility Based Agents, Learning Agents. Problem Solving: Problems, Problem Space & Search: Defining The Problem As State Space Search, Production System, Problem Characteristics, Issues In The Design Of Search Programs.

Module II

Search Techniques: Solving Problems By Searching, Problem Solving Agents, Searching For Solutions; Uniform Search Strategies: Breadth First Search, Depth First Search, Depth Limited Search, Bi-directional Search, Comparing Uniform Search Strategies. Heuristic Search Strategies: Greedy Best-First Search, A* Search, Memory Bounded Heuristic Search: Local Search Algorithms & Optimization Problems: Hill Climbing Search, Simulated Annealing Search, Local Beam Search, Genetic Algorithms; Constraint Satisfaction Problems, Local Search For Constraint Satisfaction Problems. Adversarial Search: Games, Optimal Decisions & Strategies in Games, The Mini Max Search Procedure, Alpha-Beta Pruning, Additional Refinements, Iterative Deepening.

Module III

Knowledge & Reasoning: Knowledge Representation Issues, Representation & Mapping,

Approaches to Knowledge Representation, Issues in Knowledge Representation. Using Predicate Logic: Representing Simple Fact in Logic, Representing Instant & ISA Relationship, Computable Functions & Predicates, Resolution, and Natural Deduction. Representing Knowledge Using Rules: Procedural Verses Declarative Knowledge, Logic Programming, Forward Verses Backward Reasoning, Matching, Control Knowledge.

Module IV

Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, Bayesian Networks, Dempster-Shafer Theory. Planning: Overview, Components of A Planning System, Goal Stack

Planning, Hierarchical Planning. Learning: Forms Of Learning, Inductive Learning, Explanation Based Learning, Neural Net Learning & Genetic Learning.

Module V

Natural Language Processing: Brief introduction to Syntactic Processing, Semantic Analysis, Discourse & Pragmatic Processing. Robotics: Introduction, Robot hardware, robotic perception, planning to move, planning uncertain movements, robotic software architecture, application domains.

Text Books:

1. Russel S. and Norvig P., Artificial Intelligence a Modern Approach, 3rd edition, Pearson Education.
2. Rich E. & Knight K., Artificial Intelligence, 3rd edition, TMH, New Delhi.

Reference books:

9. Patterson Dan W., Introduction to Artificial Intelligence and Expert Systems, PHI, New Delhi, 2006.
10. Rolston D.W., Principles of AI & Expert System Development, TMH, New Delhi.

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BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (B.TECH. ME)

Credit System and Marks Distribution:-

Semester-VIII

SL. No.	Category	SubjectCode	Subject Name	Periods			Credits	Marks Distribution				
				L	T	P		Internal	External		Total	
								Max	Max	Min	Max	Min
1	**PROJ**	ME801D	Project-II	Not Applicable			**8**	30	70	21	100	35

Note- A student can be allowed to do the project outside after the permission of Departmental Academic Committee. Those students doing project outside has to present their project progress every month. Those students doing project outside can be permitted to present progress every fortnight through video conferencing. Students doing project in home has to present their project progress every week.