REGULATION 2015
B.TECH - MECHANICAL ENGINEERING
CURRICULUM AND SYLLABUS

SEMESTER I

Code No.	Course Title	L	T	P	C
Theory					
BEN101	English-I	3	1	0	3
BMA101	Mathematics –I	3	1	0	3
BPH 101	Engineering Physics – I	3	0	0	3
BCH101	Engineering Chemistry – I	3	0	0	3
BCS101	Fundamentals of Computing and Programming	3	0	0	3
BBA101	Personality Development	2	1	0	2
BBT 102	Biology for Engineers	2	0	0	2
BCE101	Basic Civil Engineering	2	0	0	2
BME101	Engineering Graphics-E	2	3	0	4
Practical					
BCM1L1	Basic Civil and Mechanical Engineering Practices Laboratory	0	0	3	1
NCC/NSS/ Yoga (Optional) to be conducted during week ends					
E- Civil, Mechanical, Aeronautical Branches					

Total No. of Contact Hours: 35 **Total No. of Credits: 26**

SEMESTER II

Code No.	Course Title	L	T	P	C
Theory					
BEN 201	English-II	3	1	0	3
BMA201	Mathematics- II	3	1	0	3
BPH 201	Engineering Physics – II	3	0	0	3
BCH201	Engineering Chemistry – II	3	0	0	3
BFI201#	Foreign/Indian Language	3	0	0	3
BME202	Engineering Mechanics	3	1	0	3
BEE201	Basic Electrical and Electronics Engineering	2	0	0	2
Practical					
BCS2L2	Computer Practices Lab	0	0	3	1
BEE2L1	Basic Electrical and Electronics Engineering Practices	0	0	3	1
BPC2L1 *	Physics and Chemistry Laboratory	0	0	3/3	1
NCC/NSS/ Yoga (Optional) to be conducted during week ends					
# Any one of the following courses: BFR201 – French, BGM201 – German, BJP201- Japanese, BKR201 – Korean, BCN201 – Chinese, BTM201 - Tamil					
*Laboratory Classes on alternate weeks for Physics and Chemistry. The lab examinations will be held only in the second semester (including the first semester experiments also)					

Total No. of Contact Hours: 35 **Total No. of Credits: 23**

SEMESTER III

Code No.	Course Title	L	T	P	C
Theory					
BMA301	Mathematics III	4	1	0	4
BME301	Kinematics of Machines	3	1	0	4
BME302	Thermodynamics	3	1	0	4
BME303	Mechanics of Solids	3	1	0	4
BME304	Fluid Mechanics and Machinery	3	1	0	4
BME305	Manufacturing Technology –I	3	0	0	3
Practical					
BME3L1	Machine Drawing	1	0	3	2
BCE3L3	Fluid Mechanics, Machinery and Strength of Materials Lab	0	0	4	2

Total No. of Contact Hours: 34 **Total No. of Credits: 27**

SEMESTER IV

Code No.	Course Title	L	T	P	C
Theory					
BMA401	Numerical Methods	4	1	0	4
BME401	Dynamics of Machines	3	1	0	4
BME402	Thermal Engineering I	3	1	0	4
BME403	Industrial Metallurgy	3	0	0	3
BME404	Engineering Metrology and Instrumentation	3	0	0	3
BCE406	Environmental Studies	3	0	0	3
Practical					
BME4L1	Metrology and Metallurgy Lab	0	0	4	2
BME4L2	Manufacturing Technology Lab-I	0	0	4	2
BME4L3	Technical Seminar-I	0	0	2	1

Total No. of Contact Hours: 34 **Total No. of Credits: 26**

SEMESTER V

Code No.	Course Title	L	T	P	C
Theory					
BME501	Machine Design I	3	1	0	4
BME502	Thermal Engineering II	3	0	0	4
BME503	Fluid Power Systems	3	0	0	3
BME504	Automobile Engineering	3	0	0	3
BME505	Manufacturing Technology –II	3	0	0	3
BME5E1	Elective -I	3	0	0	3
Practical					
BME5L1	Thermal Engineering Lab	0	0	4	2
BME5L2	Manufacturing Technology Lab-II	0	0	4	2
BME5L3	Instrumentation and Dynamics lab	0	0	4	2
BME5L4	Technical Seminar-II	0	0	2	1

Total No. of Contact Hours: 34 **Total No. of Credits: 27**

SEMESTER VI

Code No.	Course Title	L	T	P	C
Theory					
BME601	Machine Design II	3	1	0	4
BME602	Finite element analysis	3	1	0	4
BME603	Heat and Mass Transfer	3	0	0	4
BME604	CAD/CAM	3	0	0	3
BME605	Industrial Robotics	3	0	0	3
BME6E1	Elective- II	3	0	0	3
practical					
BME6L1	Heat Transfer Lab	0	0	4	2
BME6L2	CAD/CAM Lab	0	0	4	2
BME6L3	Design and Fabrication Project	0	0	4	3
BME6L4	Technical Seminar -III	0	0	2	1

Total No. of Contact Hours: 34 **Total No. of Credits: 29**

SEMESTER VII

Code No.	Course Title	L	T	P	C
Theory					
BME701	Industrial Engineering	3	0	0	3
BME702	Power Plant Engineering	3	0	0	3
BME703	Operations Research for Engineers	3	1	0	4
BME7E1	Elective- III	3	0	0	3
BME7E2	Elective- IV	3	0	0	3
Practical					
BMT7L1	Fluid Power Automation Lab & Microprocessor Lab	0	0	4	2
BME7L1	Computer Aided Analysis and Simulation Lab	0	0	4	2
BME7L2	Comprehension	0	0	2	1
BME7P1	Design and fabrication project	0	0	4	2

Total No. of Contact Hours: 34 **Total No. of Credits: 23**

SEMESTER VIII

Code No.	Course Title	L	T	P	C
Theory					
BME801	Elective -V	3	0	0	3
BME8E1	Elective –VI	3	0	0	3
BME8E2	Elective –VII	3	0	0	3
Practical					
BME8L1	Project work	0	0	12	6

Total No. of Contact Hours: 21 **Total No. of Credits: 15**

TOTAL NO. OF CREDITS : 196

LIST OF ELECTIVES

Code No.	Course Title	L	T	P	C
BME001	Design of Heat Exchangers	3	0	0	3
BME002	Cryogenic Engineering	3	0	0	3
BME003	New and Renewable Sources of Energy	3	0	0	3
BME004	Energy Engineering and Management	3	0	0	3
BME005	Nuclear Engineering	3	0	0	3
BME006	MEMS & Nanotechnology	3	0	0	3
BME007	Advanced Internal Combustion Engines	3	0	0	3
BME008	Special Casting Process	3	0	0	3
BME009	Industrial Robotics	3	0	0	3
BME010	Experimental Stress Analysis	3	0	0	3
BME011	Mechanical Vibrations	3	0	0	3
BME012	Tribology	3	0	0	3
BME013	Design for Manufacturing	3	0	0	3
BME014	Plant Layout and Material Handling	3	0	0	3
BME015	Mechanics of Fracture	3	0	0	3
BME016	Wind and Solar Energy	3	0	0	3
BME017	Advanced Turbo Machines	3	0	0	3
BME018	Combustion Engineering	3	0	0	3
BME019	Computational Fluid Dynamics	3	0	0	3
BME020	Vibration Control and Condition Monitoring	3	0	0	3
BME021	Rapid Prototyping	3	0	0	3
BME022	Manufacturing of Electronic Components	3	0	0	3
BME023	Gas Dynamics and Space Propulsion	3	0	0	3
BME024	Principles of Management and Organizational Behavior	3	0	0	3
BME025	Professional Ethics	3	0	0	3
BME026	Entrepreneurship Development	3	0	0	3
BME027	Marketing Management	3	0	0	3
BME028	Engineering Economics and Financial Accounting	3	0	0	3
BME029	Total Quality Management and Reliability Engineering	3	0	0	3
BME030	Refrigeration and Air-Conditioning	3	0	0	3
BME031	Process Planning and Cost Estimation	3	0	0	3
BME032	Jigs, Fixtures and Press tools	3	0	0	3
BME 033	Composite Materials and Technology	3	0	0	3
BME 034	Electronics for mechanical systems	3	0	0	3

BEN 101- ENGLISH - I **L T P C 3 1 0 3**

Aim: To make the students learn the basics of communication in order to talk fluently , confidently and vividly.

Objective: To make them master the techniques of professional communication so that they become employable after completing the course.

Course outcomes:

CO1: After the completion of the course the students can communicate without any inferior complex
CO2: They can answer the questions asked in the campus interview without any difficulty
CO3: They very well can manage the abroad job situations.
CO4: They will become effective communicators once the course is completed.
CO5: They will get a clear idea abt LSRW(Listening, Speaking , Reading , Writing)

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	W				S							
CO2		S				S						
CO3			M									
CO4												
CO5						W						

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I **9 + 3**

Parts of speech - Active and passive voices - Subject verb agreement. - Writing about School

life, Hobbies, Family and friends – Word formation with prefixes and suffixes - Tenses - Concord - Summarizing - Note-making

UNIT II **9+3**

Cause and effect relations – Punctuations –Differences between verbal and nonverbal communication -E - mail communication – Homophones - Etiquettes of E mail communication. Interpreting graphic representation - Flow chart and Bar chart.

UNIT III **9+3**

Degrees of comparison – Positive, Comparative, Superlative - wh questions- SI units -Lab reports - Physics , chemistry, workshop and Survey report for introducing new product in the market.

UNIT IV **9+3**

Writing project proposals - Presentation skills - Prefixes and suffixes - If conditions - Writing a review-Preparing minutes of the meeting , Agenda , official circulars.

UNIT V **9+3**

Accident reports (due to flood and fire) - Hints development - Imperatives - Marking the stress Connectives , prepositional relatives.

Total: 60 Periods

Text Book

1. Department of humanities and social sciences division, Anna university, oxford university press, 2013.

Reference:

1. S.P.Danavel, English and Communication for Students of Science and engineering, Orient Blackswan, Chennai, 2011.
2. Rizvi, M.Asharaf, Effective Technical Communication, New Delhi, Tata McGraw Hill Publishibg Company, 2007.
3. MuraliKrishna and SunithaMoishra, Communication Skills for Engineers . Pearson, New Delhi, 2011..

BMA 101 ENGINEERING MATHEMATICS – I L T P C 3 1 0 3

Course Aim: To equip students with adequate knowledge of Mathematics to formulate problems in engineering environment and solve them analytically.

Course Objectives: At the end of this course, students shall be able to

i) Apply matrix operations to solve the relevant real life problems in engineering.

ii) Formulate a mathematical model for three dimensional objects and solve the concerning problems.

iii) Find area and volume based on a function with one or more variables.

Course outcome:

CO1:Apply matrix operations to solve the relevant real life problems in engineering.

CO2:Formulate a mathematical model for three dimensional objects and solve the concerning problems.

CO3:Find area and volume based on a function with one or more variables.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		W	S		M							
CO3		M		S								
CO4	S		M	W								
CO5		W	W									

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

9+3

UNIT-1 Matrices

Characteristic equations- Eigen values and eigen vectors of the real matrix- Properties- Cayley-Hamilton theorem(Excluding proof)- Orthogonal transformation of a symmetric matrix to diagonal form- Quadratic form- Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT-II Three Dimensional Analytical Geometry **9+3**

Equation of a Sphere- Plane section of a sphere- Tangent plane- Equation of cone- Right circular cone- Equation of a cylinder- Right circular cylinder.

UNIT-III Differential Calculus **9+3**

Curavuture in Cartesian coordinates- Centre and radius of curvature- Circle of curvature- Evolutes-
Envelopes- Applications of Evolutes and Envelopes.

UNIT-1V Functions of Several Variables **9+3**

Partial derivatives- **Euler's theorem for homogeneous functions**- Total derivatives- Differentiation of implicit functions- Jacobians- **Taylor's expansion**- Maxima and Minima- Method of Lagrangian multipliers.

UNIT-V Multiple Integrals **9+3**

Double integration- Cartesian and Polar coordinates- Change of order of integration- Change of variables between Cartesian and Polar coordinates- Triple integration in Cartesian coordinates-Area as double integral- Volume as triple integral.

Total : 60 Periods

TEXT BOOK:

1. Ravish R.Singh and Mukkul Bhatt, **"Engineering** Mathematics-**I" First Reprint, Tata McGraw Hill Pub Co.,**
   New Delhi. 2011.
2. **Grewal.B.S, "Higher Engineering Mathematics" , 40**th Edition, Khanna Publications, Delhi. 2007.

REFERENCES:

1. Ramana**.B.V. "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi,** 2007.
2. **Glyn James, "Advanced Engineering Mathematics", 7**th Edition, Pearson Education,

2007.
3. Erwin Kreyszig, **"Advanced Engineering Mathematics",** 8th Edition, John Wi;ey and Sons,New York, 2003.
4. **Murray R.Spiegel, "Advanced Calculus", Schaum's Outline Series,** First Edn, McGraw Hill Intl Book Co., New Delhi, , 1981.

PH 101 ENGINEERING PHYSICS – I **L T P C 3 0 0 3**

Objectives

- To make a bridge between the physics in school and engineering courses.
- To impart a sound knowledge on the basic concepts of modern sciences like engineering applications of ultrasonics, lasers, fundamentals of crystal physics and utility of solar energy.

COURSE OUTCOMES

CO1 - To Know about Ultrasonic and its application in NDT.
CO2 - To know the principle of Laser and its application in Engineering and medicine.
CO3 - Acquire Knowledge on Quantum Physics.
CO4 – Properties of Electro Magnetic Theory.
CO5 – To understand the impact of Crystal Physics.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S						M					
CO2		W	S		M				M			
CO3												
CO4	S		M	W								
CO5		W	W									

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey

Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT-I Ultrasonics **9**

Introduction – Production- Magnetostriction Effect- Magnetostriction Generator- Piezoelectric Effect- Piezo electric generator- Detection of ultrasonic waves- Properties- Cavitation- Acoustic grating -Industrial applications-Drilling, Welding, Soldering, Cleaning and SONAR- Velocity measurement- - Non-Destructive Testing (NDT) – Pulse-Echo System through transmission and reflection modes- A, B And C Scan Display methods- Important medical applications- Sonogram--problem.

UNIT-II LASER **9**

Introduction- Principle of spontaneous emission and stimulated emission- **Einstien's A &B Coefficients**-Derivation-Condition for producing aaser beam- Population inversion- Pumping- Resonance cavity- Types Of Lasers- ND-YAG- He-Ne- Co2 Lasers-Industrial applications- Heat treatment- Welding-Cutting-Medical applications-Laser surgery- Advantages & disadvantages-problem.

UNIT-III Quantum Physics **9**

Drawbacks with classical physics- Blackbody radiation: Max Planck theory and concept of energy quantization, **deduction of Wien's displacement law, Raleigh**-Jeans law – Matter waves- de Broglie wave length-photoelectric

effect – Schrödinger equation (time-independent, and time-dependent equations)- wave functions and energy spectrum- application to particle in box-problem.

UNIT – IV Electromagnetic Theory **9**

Electric charges-**Coulomb's law of inverse squares**- Electric field and its calculations-field lines-**Gauss's law**-applications of Gauss law. Magnetism - Magnetic field- Magnetic field lines- Magnetic flux- Motion of charged particles in magnetic field- Magnetic field of a moving charge. Electromagnetic wave- speed of electromagnetic wave and its quantitative deduction-group velocity- energy in electromagnetic waves- electromagnetic waves in matters-problems.

Unit-V Crystal Physics **9**

Lattice- Unit Cell- Bravais Lattice- Lattice Plane- Miller Indices- d-Spacing in cubic lattices- Calculation of number of atoms per unit cell- Atomic radius- Coordination number- Packing Factor- SC,BCC, FCC, HCP Structures- Polymorphism and Allotropy- Crystal defects- point, line and surface defects- Burger**'s v**ector-problems.

Total: 45 Periods

Text Books

1. Sears.F.W., Zemansky.M.W., **Young.H.D,;'University Physics; Narosa Publishing House.**
2. Avadhanulu. M.N.; Engineering Physics-Vol-1; S.Chand And Company Ltd, 2010.

Reference Books

1. **Rajendran.V, And Marikani . A, 'Engineering Physics' Tata Mcgrow ?Hil Publications Ltd, 3**rd Edition, New Delhi (2004).
2. **Sears., Zemansky.,, Young.;'College Physics; Addison Wesley Publishing Company.**
3. **Mukundan. A, Usha.S., Lakshmi.V; 'Engineering Physics' Scitech Publications (India) Pvt.Ltd., Chennai, 2006.**
4. Resnick, R., and Halliday, D. and Walker, J.; Fundamental of Physics; John Wiley and Sons.

BCH 101 ENGINEERING CHEMISTRY – I **L T P C 3 0 0 3**

Course Aim: To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.

Course Objectives:

i) To make the student to be conversant with the principles, water characterization and treatment for portable and industrial purposes.
ii) To impart knowledge on the essential aspects of Principles of polymer chemistry and engineering applications of polymers

iii) To impart knowledge on the essential aspects of Principles electrochemistry, electrochemical cells, emf and applications of emf measurements
iv) To make the students understand the Principles of corrosion and corrosion control and

v) To impart knowledge about the Conventional and non-conventional energy sources and energy storage devices .

Course outcomes:

CO1 – Having a knowledge of Water characterization and treatment of portable and Industrial purposes.
C**O2** – Having the thinking of Principles of polymer chemistry and engineering applications of polymers.
CO3 – Having a deep knowledge about the Principles of electrochemistry
CO4 – With a true wisdom about Corrosion
CO5 - Having a sound knowledge in the Field of the Conventional and non-Conventional energy.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		W	S		M							
CO3		M		S								
CO4	S		M	W								
CO5		W	W									

Course Assessment Method

Direct	Indirect
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I Water Technology **9**

Introduction-Characteristics : Hardness of water – types - temporary and permanent hardness - estimation by EDTA method Alkalinity – types of alkalinity - Phenolphthalein and Methyl orange alkalinity - determination –Domestic water treatment – disinfection methods (Chlorination, ozonation , UV treatment) Boiler feed water – requirements – disadvantages of using hard water in boilers Internal conditioning (Calgon Conditioning method) – External conditioning – Demineralization process – Desalination and Reverse osmosis.

UNIT II Polymers **9**

Introduction-Polymers- definition – polymerization – degree of polymerisation - types of polymerisation – Addition polymerisation and Condensation polymerization – Mechanism of Polymerisation - free radical polymerization mechanism only, Plastics: Classification – thermoplastics and thermosetting plastics – difference between thermoplastics and thermosetting plastics - preparation, properties and uses of PVC, Teflon, nylon-6,6, PET, Rubber :Types – drawbacks of natural rubber -vulcanization of rubber - properties and uses of vulcanized rubber Synthetic rubbers – butyl rubber and SBR

UNIT III Electro chemistry **9**

Introduction CELLS: types of Electrochemical cells , Electrolytic cells – Reversible and irreversible cells EMF – measurement of emf – Single electrode potential – Nernst equation Reference electrodes : Standard Hydrogen electrode -Calomel electrode Ion selective electrode :Glass electrode and measurement of pH using Glass electrode Electrochemical series – significance Titrations :Potentiometer titrations (redox - Fe^{2+} vs dichromate titrations) Conductometric titrations (acid-base – HCI vs, NaOH titrations)

UNIT IV Corrosion and Corrosion Control **9**

Introduction: Chemical corrosion Definition - Chemical Corrosion - Electrochemical corrosion – different types – galvanic corrosion – differential aeration corrosion – mechanism of Chemical and Electrochemical corrosion factors influencing corrosion Corrosion control – sacrificial anode

and impressed cathodic current methods – Protective coatings :Paints – constituents of the paint and their functions Metallic coatings – electroplating of Gold and electroless plating of Nickel.

UNIT V Non-Conventional Energy Sources and Storage Devices 9

Introduction : Nuclear fission and nuclear fusion reactions – differences between nuclear fission and nuclear fusion reactions – nuclear chain Reactions – nuclear energy critical mass - super critical mass - sub - critical mass Light water nuclear reactor for power generation (block diagram only) – breeder reactor Solar energy conversion – solar cells – wind energy Fuel cells – hydrogen – oxygen fuel cell Batteries :Primary and secondary Batteries – differences between Primary and secondary Batteries Secondary batteries :Lead–acid storage battery –working –uses Nickel–cadmium battery - working –uses Solid – state battery : Lithium battery

TOTAL: 45 PERIODS

TEXT BOOKS:

1. **P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi (2002).**
2. **S.S. Dara "A text book of engineering chemistry" S.Chand & Co.Ltd., New Delhi (2006).**
3. P. J. Lucia, M. S**ubhashini, "Engineering Chemistry, Volume 1", Crystal Publications, Chennai, (2007).**
4.

REFERENCES:

1. **B.K.Sharma "Engineering chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2001).**
2. **B. Sivasankar "Engineering Chemistry" Tata McGraw**-Hill Pub.Co.Ltd, New Delhi (2008)

BCS 101 FUNDAMENTALS OF COMPUTING AND PROGRAMMING L T PC 3 0 0 3

Course Objectives:

1. To enable the student to learn the major components of a computer system.
2. To know the correct and efficient way of solving problem.
3. To learn to use office automation tools.
4. To learn and write program in "C".

Course Outcome:

CO1: Student will understand the major components of computer systems.
CO2: Will know the correct and efficient way of solving problems.
CO3:Will learn the use of automation tools.
CO4: Will learn and write program in " C".

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		W	S		M							
CO3		W		S								
CO4	M		M	W								
CO5		W	W									

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I: Introduction to Computer **9**

Introduction-Characteristics of computer-Evolution of Computers-Computer Generations -

Classification of Computers-Basic Computer Organization-Number system. Computer Software: Types of Software—System software-Application software-Software Development Steps

UNIT II: Problem Solving and Office Automation **9**

Planning the Computer Program – Purpose – Algorithm – Flowcharts– Pseudo code Introduction to Office Packages: MS Word , Spread Sheet, Power Point, MS Access, Outlook.

UNIT III: Introduction to C **9**

Overview of C-Constants-Variables-Keywords-Data types-Operators and Expressions - Managing Input and Output statements-Decision making-Branching and Looping statements.

UNIT IV: Arrays and Structures **9**

Overview of C-Constants, Variables and Data types-Operators and Expressions -Managing Input and Output operators-Decision making-Branching and Looping.

UNIT V: Introduction to C++ **9**

Overview of C++ - Applications of C++-Classes and objects-OOPS concepts -Constructor and Destructor- A simple C++ program –Friend classes and Friend Function.

Total: 45 Periods

Text books:

1. Ashok, N.Kamthane,**"Computer Programming", Pearson Education (2012).**
2. **Anita Goel and Ajay Mittal,"Computer Fundamentals and Programming in C", Dorling Kindersley**

   (India Pvt Ltd).,Pearson Education in South Asia,(2011).
3. **Yashavant P. Kanetkar, "Let us C",13th Edition,BPB Public**ations(2013).
4. **Yashavant P. Kanetkar,"Let us C++"10th Edition, BPB Publications (2013).**

References:

1. **Pradeep K.Sinha, Priti Sinha "Foundations of Computing", BPB Publications (2013).**
2. **Byron Gottfried, "Programming with C", 2nd edition, (Indian Adapted** Edition), TMH publication.
3. **PradipDey,ManasGhosh,Fundamentals of Computing and Programming in 'C' First Edition ,Oxford** University Press(2009)
4. The C++ Programming Language ,4thEdition,BjarneStroustrop,Addison-Wesley Publishing Company(2013)

BBA101/BBA102 Personality Development **L T P C 1 1 0 2**

Aim: The students should be able to act with confidence, be clear about their own personality, character and future goals.

Instructional Objectives:

- To make students understand the concept and components of personality and thereby to apply the acquired knowledge to themselves and mould their personality.
- To impart training for positive thinking, this will keep the students in a good stead to face the challenges.
- To bring out creativity and other latent talents with proper goal setting so that self- esteem gets enhanced.
- To develop an individual style and sharpen the skills in the area of leadership, decision making, time management and conflict management.
- To sharpen the employability skills of the professional undergraduate students and aid them in landing in the desired job.

Course Outcomes:

CO1: Will understand the concept of personality .
CO2: Will get positive thinking and become capable of facing challenges.
CO3: Will develop a individual style.
CO4: Employability will be sharpen

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2		W	W		M							
CO3		M		W								
CO4			M	W								
CO5		W	W									

Course Assessment Method

Direct	Indirect
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I Introduction to Personality Development **9**

The concept personality- Dimensions of theories of Freud & Erickson- personality – significant of personality development. The concept of success and failure: What is success? - Hurdles in achieving success - Overcoming hurdles - Factors responsible for success **–** What is failure - Causes of failure. SWOT analyses.

UNIT II Attitude & Motivation **9**

Attitude - Concept - Significance - Factors affecting attitudes - Positive attitude - Advantages **–**Negative attitude - Disadvantages - Ways to develop positive attitude - Difference between personalities having positive and negative attitude. Concept of motivation - Significance - Internal and external motives - Importance of self-motivation- Factors leading to de-motivation

Unit III Self-esteem **9**

Term self-esteem - Symptoms - Advantages - Do's **and Don'ts to develop positive self**-esteem **–** Low self-esteem - Symptoms - Personality having low self esteem - Positive and negative self-esteem. Interpersonal Relationships **–** Defining the difference between aggressive, submissive and assertive behaviours - Lateral thinking.

Unit IV Other Aspects of Personality Development **9**

Body language - Problem-solving - Conflict and Stress Management - Decision-making skills -Leadership and qualities of a successful leader - Character-building -Team-work - Time management -Work ethics **–**Good manners and etiquette.

Unit V Employability Quotient **9**

Resume building- The art of participating in Group Discussion **–** Acing the Personal (HR &

Technical) Interview -Frequently Asked Questions - Psychometric Analysis - Mock Interview Sessions.

Total: 45 Periods

Text Books:

1. Hurlock, E.B (2006). Personality Development, 28th Reprint. New Delhi: Tata Mc Graw Hill.
2. Stephen P. Robbins and Timothy A. Judge(2014), Organizational Behavior 16 th Edition: Prentice Hall.

Reference Books:

1. Andrews, Sudhir. How to Succeed at Interviews. 21st (rep.) New Delhi.Tata McGraw-Hill 1988.
2. Heller, Robert.Effective leadership. Essential Manager series. Dk Publishing, 2002
3. Hindle, Tim. Reducing Stress. Essential Manager series. Dk Publishing, 2003
4. Lucas, Stephen. Art of Public Speaking. New Delhi. Tata - Mc-Graw Hill. 2001
5. Mile, D.J Power of positive thinking. Delhi. Rohan Book Company, (2004).
6. Pravesh Kumar. All about Self- Motivation. New Delhi. Goodwill Publishing House. 2005.
7. Smith, B . Body Language. Delhi: Rohan Book Company. 2004

BBT102 BIOLOGY FOR ENGINEERS **L T P C 2 0 0 2**

Course Aim: To provide a basic understanding of biological mechanisms and their applications from the perspective of engineers

Course Objectives:

The Students will be able to

- To understand the fundamentals of living things, their classification, cell structure and biochemical constituents
- To apply the concept of plant, animal and microbial systems and growth in real life situations
- To comprehend genetics and the immune system
- To know the cause, symptoms, diagnosis and treatment of common diseases
- To give a basic knowledge of the applications of biological systems in relevant industries

Course Outcomes:

CO1: Student will understand the fundamentals of living things and their Classification.

CO2: Able to apply biological concept in real life situation.

CO3: Will have the basic knowledge in application of biological system in relevant industries.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		W	S		M							
CO3		M		S								
CO4												
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT-I Introduction to Life **7**

Characteristics of living organisms-Basic classification-cell theory-structure of prokaryotic and eukaryotic cell-Introduction to biomolecules: definition-general classification and important functions of carbohydrates-lipids-proteins-nucleic acids vitamins and enzymes-genes and chromosome.

UNIT-II Biodiversity **6**

Plant System: basic concepts of plant growth-nutrition-photosynthesis and nitrogen fixation-Animal System: elementary study of digestive-respiratory-circulatory-excretory systems and their functions-Microbial System: history-types of microbes-economic importance and control of microbes.

UNIT-III Genetics and Immune System

Evolution: theories of evolution-**Mendel's** cell division**–**mitosis and meiosis-evidence of e **laws of inheritance**-variation and speciation- nucleic acids as a genetic material-central dogma immunity-antigens-antibody-immune response.

UNIT-IV Human Diseases **4**

Definition- causes, symptoms, diagnosis, treatment and prevention of diabetes, cancer, hypertention, influenza, AIDS and Hepatitis

UNIT-V Biology and its Industrial Application **8**

Transgenic plants and animals-stem cell and tissue engineering-bioreactors-biopharming-recombinant vaccines-cloning-drug discovery-biological neural networks-bioremediation-biofertilizer-biocontrol-biofilters-biosensors-biopolymers-bioenergy-biomaterials-biochips-basic biomedical instrumentation.

Total: 45 Periods

Text Books:

1. A Text book of Biotechnology, R.C.Dubey, S. Chand Higher Academic Publications, 2013
2. Diseases of the Human Body, Carol D. Tamparo and Marcia A. Lewis, F.A. Davis Company, 2011
3. Biomedical instrumentation, Technology and applications, R. Khandpur, McGraw Hill Professional, 2004

Reference Books

1. Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011
2. Cell Biology and Genetics (Biology: The unity and diversity of life Volume I), Cecie Starr, Ralph Taggart, Christine Evers and Lisa Starr, Cengage Learning, 2008
3. Biotechnology Expanding horizon, B.D. Singh, Kalyani Publishers, 2012

BCE 101/BCE 201 BASIC CIVIL ENGINEERING **L T P C 2 0 0 2**

Course Objectives: At the end of this course, students shall be able to

- To expose students with the basics of Civil Engineering
- To understand the components of a building

- To Learn Engineering aspects related to dams, water supply, and sewage disposal

Course objective:

CO1: Students will be exposed to basics of civil engineering.
CO2 : Will understand the components of buildings.
CO3 : Will learn the engineering aspects to dams , water supply and sewage disposal.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		W	S		M							
CO3		M		S								
CO4												
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT- I Civil Engineering Materials **8**

Introduction – Civil Engineering – Materials – Stones – Bricks – Sand – Cement – Plain Concrete – Reinforced Cement Concrete – Steel Sections – Timber – Plywood – Paints – Varnishes (simple examples only)

UNIT- II Surveying **5**

Surveying – objectives – classification – principles of survey-Measurement of distances – Chain survey – Determination of areas – Use of compass – Use of leveling Instrument – (simple examples only)

UNIT- IIIFoundation for Building **5**

Bearing Capacity of Soil – Foundation – Functions – Requirement of good foundations – Types of foundations – Merits & Demerits.

UNIT- IV Superstructure **7**

Stone Masonry – Brick Masonry – Columns – Lintels – Beams – Roofing – Flooring – Plastering – White Washing (Simple examples only)

UNIT- V Miscellaneous Topics **5**

Types of Bridges –Dam- purpose – selection of site - Types of Dams – Water Treatment & Supply sources – standards of drinking- distribution system. – Sewage Treatment (simple examples only)

TOTAL : 30 PERIODS

Text Books:

1. **Raju .K.V.B, Ravichandran .P.T, "Basics of Civil Engineering"**, Ayyappa Publications, Chennai, 2012.
2. Seetharaman **S., "Basic Civil Engineering", Anuradha Agencies, (**1st ed. 2005).
3. **Dr.M.S Palanisamy, "Basic Civil Engineering" (3**rd ed. 2000), TUG Publishers, New Delhi/Tata Mc Graw Hill Publication Co., New Delhi

Reference Books:

1. **Rangwala .S.C," Engineering Material"s**, Charotar Publishing House, Anand, 41st Edition: 2014.
2. **National Building Code of India, Part V, "Building Materials"**, 2005
3. Ramesh Babu **"A Textbook on Basic Civil Engineering" (1998). Anuradha Agencies, Kumbakonam.**
4. Ramamrutham **S., "Basic Civil Engineering", Dhanpat Rai Publishing Co. (P) Ltd. (1999).**

BME 101 ENGINEERING GRAPHICS- E **L T P C 2 0 3 4**

Aim

To develop graphical skills in students for communication of concepts, design ideas of engineering products and expose them to existing standards related to technical drawings.

Objectives

- To visualize and produce two dimensional graphic representation of three dimensional objects and buildings.
- To comprehend and visualize 3D views of objects.
- To understand and generate the different curves used in engineering applications.
- To introduce the fundamental of CAD Graphics used in design.
- To visualize interior portions of object and also to draw the surfaces necessary for producing prisms, pyramids, cone, tray, duct etc.,

Course Outcomes:

CO1: Student Ability of visualization will increase.
CO2: Student will understand and develop different engineering curves.
CO3: student will understand the application of computer in graphics.
CO4: Will understand the surface necessary for producing different solids
CO5: Understand the importance of graphical representations of engineering components .
CO5: They will get a clear idea abt LSRW(Listening, Speaking , Reading , Writing)

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S								W			
CO2		W	S		M					W		
CO3		M		S								
CO4	S		M	W								
CO5		W	W									

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT-I Basic Curves, Projection of points and Straight lines **6+6**

Conics-construction of ellipse, parabola and hyperbola by eccentricity method-construction of cycloids- construction of involutes of square and circle-Drawing of tangent and normal to the above curves-Scales-Basic drawing conventions and standards-Orthographic projection principles- Principal planes-First angle projection- Projection of points. Projection of

straight lines (only first angle projections) inclined to both the principal planes- Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces.

UNIT-II Projections of Planes and solids **6+6**

Projection of planes (Polygonal and circular surfaces) inclined to both the principal planes. Projection of simple solids like prisms, pyramids, cylinder, cone, tetrahedran and truncated solids when the axis is inclined to one of the principal planes/ both principal planes by rotating object method and auxiliary plane method.

UNIT-III Orthographic Projections, Isometric projections & Free hand sketching **6+6**

Orthographic projection of Simple parts from 3D diagram-Principles of isometric projection and isometric view-isometric scale- Isometric projections of simple solids and truncated solids-Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems Free hand sketching of orthographic & Isometric projection

UNIT-IV Projection of Sectioned solids and development of surfaces **6+6**

Sectioning of solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other-obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids- Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes

.

UNIT-V Perspective projection, building drawing and Computer aided drafting **6+6**

Perspective projection of simple solids-Prisms, Pyramids and cylinders by visual ray method. Introduction- components of simple residential or office building-specifications-plan and elevation of different types of Residential buildings and office buildings. Introduction to drafting packages and basic commands used in AUTO CAD. Demonstration of drafting packages.

Total: 60 Periods

Text Books:

1. **N.D.Bhatt and V.M.Panchal, "Engineering drawing", charotar publishing house, 50th** edition, 2010.
2. **K.V.Natarajan "A Text book of Engineering Graphics",Dhanalakshmi Publishers, Chennai, 2009.**

References:

1. **K.R.Gopalakrishna, "Engineering drawing",(Vol**-I & II combined)Subhas stores,

Bangalore,2007.
2. **K.Venugopal and V. PrabhuRaja, "Engineering Graphics",New age International Private limited,2008.**
3. **Luzzader, Warren.J., and Duff, John.M.,, "Fundamental**s of Engineering Drawing with an introduction to **Interactive computer graphics for design and production", Eastern economy edition,Prentice Hall of India Pvt** Ltd,New Delhi,2005.

Special points applicable to University Examinations on Engineering Graphics

1) There will be five questions, each of either or type covering all units of the syllabus.
2) All questions will carry equal marks of 20 each making a total of 100.

BCM1L1/ BCM2L1BASIC CIVIL & MECHANICALENGINEERING PRACTICES LABORATORY

L T P C 0 0 2 1

Objectives

To provide exposure to the students with hands on experience on various basic Civil & Mechanical Engineering practices.

Course Outcomes

CO1: To provide hands on exercises in common plumbing and carpentry works associated with residential and industrial buildings.

CO2: students will get exposure regarding pipe connection for pumps & turbines and to study the joint used in roofs, doors, windows and furnitures.

CO3 students will get hands on exercise on basic welding, machining and sheet metal works.

CO4 students will get exposure regarding smithy, foundry operations and in latest welding operations such as TIG, MIG, CO2, spot welding etc.,

CO5 students will get exposure regarding the construction and working of centrifugal pump, air-conditioner and lathe.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S								M			

CO2		W	S		M				M		W	
CO3		M		S		W			M			
CO4			W									
CO5				M		M						

Practical

Direct	**Indirect**
Observation Book	Student Exit Survey
Record Book	Faculty Survey
Model exam	Industry
Viva Voce	Alumni
End semester exam	

g.

Basic Machining:

a) Simple Turning and Taper turning
b) Drilling Practice

Sheet Metal Work:

a) Forming & Bending:
b) Model making – Trays, funnels, etc.
c) Different type of joints.
d) Preparation of air-conditioning ducts.

Machine assembly practice:

a) Assembling, dismantling and Study of centrifugal pump
b) Assembling, dismantling and Study of air conditioner
c) Assembling, dismantling and Study of lathe.

Moulding: Moulding operations like mould preparation for gear and step cone pulley etc.,

Fitting: FittingExercises – Preparation of square fitting and vee – fitting models.

Demonstration:

a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.
b) Gas welding.

REFERENCES:

1. K. Jeyachandran, S. Nararajan & S, **Balasubramanian, "A Primer on Engineering Practices Laboratory"** , Anuradha Publications, (2007).
2. T.Jeyapoovan, M. Saravanapandian & S. Pranitha, **"Engineering Practices Lab Manual",Vikas Pub**lishing House Pvt. Ltd. (2006)
3. **H. S. Bawa, "Workshop Practice",Tata McGraw –** Hill Publishing Company Limited, (2007).
4. **A. Rajendra Prasad & P. M. M. S Sarma, "Workshop Practice", Sree Sai Publication, (2002).**
5. P. **Kannaiah & K.L. Narayana, "Manual on Workshop Practice", Scitech Publication, (1999).**

BEN 201 ENGLISH II **L T P C 3 1 0 3**

Aim: To make the students learn the basics of communication in order to talk fluently , confidently and vividly.

Objective: To make them master the techniques of professional communication so that they become employable after completing the course

Course outcomes:

CO1: After the completion of the course the students can communicate without any inferior complex.
CO2: They can answer the questions asked in the campus interview without any difficulty
CO3: They very well can manage the abroad job situations.
CO4: They will become effective communicators once the course is completed.
CO5: They will get a clear idea abt LSRW(Listening, Speaking , Reading , Writing)

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		W	S		M							
CO3		M		S								
CO4	S		M	W								
CO5		W	W									

Course Assessment Method

Direct	Indirect
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I Orientation 9 + 3

Numerical adjectives - Meanings in context - Same words used as different parts of speech - Paragraph writing - Non- verbal communication - Regular and Irregular verbs.

UNIT II Oral Skill 9 + 3

Listening to audio cassettes - C.Ds , News bulletin - Special Lectures, Discourse - Note taking - Sentence patterns - SV, SVO, SVC, SVOC, SVOCA - and Giving Instructions - Reading Comprehension answering questions. Inferring meaning.

UNIT III Thinking Skill 9+3

Self- introduction describing –Group Discussion – Debate –Role play- Telephone- Things-etiquette- Recommendation and Sequencing jumbled sentences to make a suggestions-paragraph-advertisement and notice, Designing or drafting posters, writing formal and informal invitations and replies.

UNIT IV Writing Skill 9 + 3

Definitions - Compound nouns - Abbreviations and acronyms - business or official letters(for making enquiries, registering complaints, asking for and giving information, placing orders and sending replies):

(b) letters to the editor(giving suggestions on an issue) .

UNIT V Formal Information 9 + 3

Editing **–** Prepositions - Articles - Permission letter for undergoing practical training , Essay writing - Application for a job , letter to the principal authorities regarding admissions, other issues, requirement or suitability of course etc.

Total: 60 Periods

TEXT BOOK:

1. Meenakshi Raman, SangeethaSharma , Technical English for Communication: Principle and Practice, OUP, 2009.

REFERENCE BOOKS:

1. Sumanth , English for engineers, Vijay Nicole , Imprints pvt ltd.2013.

2. Meenakshi Raman and SangeethaSharma , Technical Communication Principles and Practice, Oxford University Press, 2009.

3. Sangeetha Sharma, Binodmishra , Communication skills for engineers and scientists , PHI Learning Pvt Ltd, New Delhi, 2010.

BMA 201 - ENGINEERING MATHEMATICS – II L T P C 3 1 0 3

Course Aim: To impart adequate knowledge of Mathematics to the students so as to formulate problems in engineering environment and solve them using mathematical tools.

Course Objectives:

- At the end of this course, students shall be able toSolve differential equations, simultaneous linear equations, and some special types of linear equations related to engineering.
- Deal with applications in a variety of fields namely fluid flow, heat flow, solid mechanics, electrostatics, etc.

- Find intensity of degree of relationship between two variables and also bring out regression equations.

Course outcome:

CO1:Apply matrix operations to solve the relevant real life problems in engineering.

CO2:Formulate a mathematical model for three dimensional objects and solve the concerning problems.

CO3:Find area and volume based on a function with one or more variables.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		W	S		M							
CO3		M		S								
CO4	S		M	W								

CO5		W	W									

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I Ordinary Differential Equation **9+3**

Higher order linear differential equations with constant coefficients - Method of variation of parameters **– Cauchy's** and L**egendre's linear equations** - simultaneous first order linear equations with constant coefficients.

UNIT IIVector Calculus **9+3**

Gradient,divergence and curl **–**Directional derivatives **–** Irrotational and solenoidal vector fields **–** vector integration**– Green's theorem in a plane , Gauss divergence theorem and** S**toke's theorem (**without proofs) **–** simple applications involving cubes and rectangular parallelepipeds.

UNIT III Analytic Functions **9+3**

Functions of a complex variable **–** Analytic functions **–** Necessary conditions, Cauchy-Riemann equation and sufficient conditions (without proofs) **–** Harmonic and orthogonal properties of analytic functions **–** Harmonic conjugate **–** construction of analytic functions **–** conformal mapping : W= Z+C,CZ , 1/Z and bilinear transformation.

UNIT IV Complex Integration **9+3**

Complex integration **– Statement and application of Cauchy's integral theorem and Cauchy's integral formula –**Taylor and Laurent expansions **–** Singular points **–** Residues **–** Residue theorem **–**Application of Residue theorem to evaluate real integrals **–** Unit circle and semi-circular contour (excluding ploes on boundaries).

UNIT VStatistics **9+3**

Mean, Median, Mode **–** Moments **–** Skewness and Kurtosis **–** Correlation **–** Rank Correlation **–** Regression **–**Chi square test for contingency tables.

Total : 60 Periods

TEXT BOOK :

1. **1 . R.M.Kannan and B.Vijayakumar " Engineering Mathematics – II " 2nd**

Edition , SRB Publication , Chennai 2007.
2. **Bali.N.P and Manish Goyal , " Engineering Mathematics " , 3rd** Edition , Laxmi Publications (p) Lltd, 2008 .
3. **Grewal .B/S " Higher Engineering Mathematics" , 40th** Editon , Khanna Publications , Delhi , 2007 .

REFERENCES :

1. **Ramana.B.V , " Higher Engineering Mathematics " , Tata McGraw Hill Publishing Company , New Delhi,** 2007.
2. **Gupta SC, and VK.Kapoor, "Fundamentals Mathematical Statistics",** 11th edition, Sultan Chand Sons, , New Delhi, 2014.

BPH 201 ENGINEERING PHYSICS – II **L T P C 3 0 0 3**

Objectives

- To expose the students to multiple areas of science of engineering materials which have direct relevance to different Engineering applications
- To understand the concepts and applications of conducting, Semiconducting, magnetic & dielectric materials as well as their optical properties.

Course outcomes

CO1 - To Know about properties and advancements of conducting materials .
CO2 - To Know the principle and properties semiconducting materials.
CO3 - Acquire Knowledge on magnetic and dielectric materials
CO4 – To Know about the creation of new materials with novel properties
CO5 – To Understand the impact of light in technical uses

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		W	S		M							
CO3		M		S								
CO4	S		M	W								
CO5		W	W									

Course Assessment Method

Direct	Indirect
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT – I Conducting Materials **9**

Classical Free Electron Theory of Metals- Drawback of Classical Theory – Wiedemann Franz Law-Density of States- Fermi-Dirac Statistics- Calculation of Fermi Energy and Its Importance - High Resistivity Alloys – Super Conductors – Properties and Applications – Magnetic Levitation, SQUIID, Cryotron.

UNIT – II Semiconducting Materials **9**

Elemental and Compound Semiconductors and Their Properties- Carrier Concentrations (Electrons and Holes) In Intrinsic Semiconductors - Carrier Concentrations in N- Type and P- Type Semiconductors – Variation of Fermi Level and Carrier Concentration With Temperature - Variation of Conductivity With Temperature – Band Gap Determination – Hall Effect – Experimental Arrangement - Application.

UNIT-III Magnetic and Dielectric Materials **9**

Different Type of Magnetic Material And Their Properties – Hard And Soft Magnetic Material – Domain Theory Of Ferromagnetism – Hysteresis – Energy Product of Magnetic Materials – Ferrites and Their Applications – Various Polarization Mechanisms In Dielectric – Frequency and Temperature Dependence – Internal Field and Detection of Classius – Mosotti Equation – Dielectric Loss- Dielectric Breakdown.

UNIT- IV New Engineering Material **9**

Shape memory Alloys- Types- General Characteristics- Applications – Metallic Glasses- Properties-Applications –transformer as a Core Material – Nano Phase Materials – Properties – Production – Ball
Milling Technique – Sol- Gel Method – Chemical Vapour Deposition - Applications.

UNIT-V Optical Materials and Optical Fibers **9**

Light Interaction With Solids- Classification of Optical Material – Optical Properties of Metals, Insulator And Semiconductors – Traps – Colour Centers – Luminescence – phosphorescence – LED – LCD – Construction and Working – Advantages and Disadvantages – Applications. Principle and Propagation of Light In Optical Fibers - Numerical Aperture And Acceptance Angle- Types Optical Fibers (Material, Refractive Index, Mode based) - Double Crucible Technique of Fiber Drawing.

Total: 45Periods

TEXT BOOKS

1. **"**Science **of engineering materials", by Dr. A.Mukunthan and S.Usha –** SciTech publications (india) Pvt Ltd; chennai, (2007).
2. Charless Kittel **'introduction to solid state physics', john wiley & sons, 7**th edition, singpore (2007).

REFERENCE BOOKS

1. Material science by r.suresh, v. jayakumar – lakshmi publications; arapakkam (2006).
2. Material science by Dr. P. K. Palanisamy – Scietech publications (india) Pvt Ltd, chennai (2006).
3. **Rajendran V and Marikani a, 'material science' tata mcgraw hill publications Ltd, 3**rd edition , new delhi (2004).
4. **M.Arumugam, 'material science', anuradha publications, kumbakonam (2006).**

BCH 201 ENGINEERING CHEMISTRY – II **L T P C 3 0 0 3**

Course Aim: To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.

Course Objectives:

- To make the students to have a sound knowledge with industrial applications of surface chemistry
- To impart knowledge about the Industrial importance of Phase rule and alloys
- To make the students to be conversant with Analytical techniques and their

importance

- To have an idea and knowledge about the Chemistry of Fuels and
- To make them study to have a deep knowledge in Chemistry of engineering materials

Course outcomes:

CO1 – Having a knowledge of industrial applications of Surface Chemistry
CO2 – Having the thinking of industrial importance of Phase rule and alloys
CO3 – Having a deep knowledge with Analytical techniques and their importance.
CO4 – With a true wisdom about Chemistry of Engineering materials.
CO5 - Having a well-versed knowledge of the Chemistry of Fuels and Combustion.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		W	S		M							
CO3		M		S								
CO4	S		M	W								
CO5		W	W									

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I - Surface Chemistry **9**

Introduction **:** Adsorption , absorption , desorption , adsorbent , adsorbate and sorption **–** (definition only) Differences between adsorption and absorption Adsorption of gases on solids **–** factors affecting adsorption of gases on solids **–** Adsorption isotherms **–** Frendlich adsorption isotherm and Langmuir adsorption isotherm Role of adsorbents in catalysis, Ion-exchange adsorption and pollution abatement.

UNIT II - Phase Rule and Alloys **9**

Introduction **:**Statement of Phase Rule and explanation of terms involved **–** one component

system – water system – Construction of phase diagram by thermal analysis - Condensed phase rule [Definition only] Two Component System : Simple eutectic systems (lead-silver system only) – eutectic temperature – eutectic composition – Pattinsons Process of desilverisation of Lead Alloys : Importance, ferrous alloys – nichrome and stainless steel – 18/8 stainless steel -heat treatment of steel – annealing – hardening – tempering normalizing – carburizing - nitriding . Non- ferrous alloys: Brass and Bronze

UNIT III - Analytical Techniques **9**

Introduction: Type of Spectroscopy - Atomic spectroscopy – molecular spectroscopy - Explanation IR spectroscopy – principles – instrumentation (block diagram only) – applications - finger print region UV-visible spectroscopy –– principle – instrumentation (block diagram only) – Beer-**Lambert's law**- – estimation of iron by colorimetry – Atomic absorption spectroscopy- principle - instrumentation (block diagram only) - estimation of Nickel by Atomic absorption spectroscopy Flame photometry– principles – instrumentation (block diagram only) - estimation of sodium ion by Flame photometry

UNIT IV - Fuels **9**

Introduction **:** Calorific value – types of Calorific value - gross calorific value – net calorific value Analysis of Coal –- Proximate and ultimate analysis – hydrogenation of coal - Metallurgical coke – manufacture by Otto-Hoffmann method Petroleum processing and fractions – cracking – catalytic cracking – types – fixed bed catalytic cracking method- Octane number and Cetane number (definition only) Synthetic petrol – Bergius processes – Gaseous fuels- water gas, producer gas, CNG and LPG (definition and composition only) Flue gas analysis – importance - Orsat apparatus

UNIT V Engineering Materials **9**

Introduction : Refractories – classification – acidic, basic and neutral refractories – properties (refractoriness, refractoriness under load, dimensional stability, porosity, thermal spalling) Manufacture of Refractories : alumina bricks and Magnesite bricks, Abrasives – natural and synthetic abrasives Natural type : Siliceous - quartz ; Non –siliceous – diamond Synthetic Abrasives : silicon carbide and boron carbide. Lubricants : Liquid lubricants - Properties – viscosity index, flash and fire points, cloud and pour points, oilyness) Solid lubricants – graphite and molybdenum sulphide

TOTAL: 45 PERIODS

TEXT BOOKS:

1. **P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai** Pub, Co., New Delhi (2002).
2. **S.S.Dara "A text book of Engineering Chemistry" S.Chand & Co.Ltd., New Delhi (2006).**
3. **P. J. Lucia, M. Subhashini, "Engineering Chemistry, Volume 1", Crystal Publications, Chennai, (2007).**

REFERENCES:

1. **B.Sivasankar "Engineering Chemistry" Tata McGraw-**Hill Pub.Co.Ltd, New Delhi (2008).
2. **B.K.Sharma "Engineering Chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2001).**

BFR 101 / 201 FRENCH **L T P C 3 0 0 3**

Importance of the Course:

1. Learning a language is almost akin to a journey of discovery. It not only opens up a whole new **dimension but also contributes significantly to the development of an individual's** intelligence.

2. Language gives us access and insights into another culture. It is a fundamental truth that cultures define themselves through languages.

3. Since language is a symbol of culture, the curriculum for all the languages reflects this spirit.

Course Objective

The Basic Course in French is designed to :

1. Introduce the basics of the language to beginners

2. To develop their knowledge as well as their communicative skills so as to be able to respond in simple everyday contexts.

Synchronies I consists of 13 lessons with each lesson presenting a dialogue and giving the know-how, grammatical and lexical notions as well as activities required for communication. In addition, Synchronies I includes documents which initiate the learners to another world, another culture and which acclimatize them to the authentic use of the French language through the exploitation of written and iconographic documents. The Indian context has been used.

Course Objective :

CO1: Will have a basic knowledge on Foreign Languages, foreign culture and heritage.
CO2: Will able to read and write a foreign language.
CO3: Will get sufficient exposure for developing basic conversational skills.

CO4: Will impart knowledge on foreigh lifestyle.
CO5: Will gain confidence to survive in global environment.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		W	S		M							
CO3		M		S								
CO4	S		M	W								
CO5		W	W									

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT – I: **9**

At the airport: Savoir**–** faire: exchanging greetings, self introduction, introducing another, welcoming someone, identifying someone - Grammar: verbs ‘to be’, ‘to call oneself’, subject pronouns, interrogation

UNIT – II **9**

At the University: Savoir-faire: enquiring after one’s welfare, taking leave, expressing appreciation -Grammar: definite & indefinite articles, gender of nouns, adjectives, present tense of regular ‘er’ verbs, ‘to have’, ‘to learn’, negation, irregular verbs

UNIT – III **9**

At the café: Savoir –faire: speaking about one’s likes, giving information, expressing admiration, asking information about someone - Grammar: Interrogative adjectives, irregular verbs, possessive and interrogative adjectives

UNIT – IV **9**

At the beach: Savoir faire: proposing an outing, accepting/ refusing the proposal - Grammar:

singular & nplural, indefinite pronoun, demonstrative adjectives, negation, irregular verbs

UNIT – V

A concert: Savoir –faire: inviting, accepting, expressing one's inability to accept an invitation

UNIT – VI

Grammar: Present tense of more irregular verbs, contracted articles, future tense, interrogative adverbs, **At Nalli's** Savoir- faire: asking the price of an article, protesting against the price, Grammar: possessive adjectives, exclamative adjectives, imperative tense

Total: 45 hours

REFERENCES:

- Course Material: Synchronie I – Méthode de Français
- Madanagobalane -Samita Publications, Chennai, 2007

BGM 101/ 201 GERMAN **L T P C 3 0 0 3**

Course Aim: To equip students with some basic knowledge of German to get oriented to the new problems in global environment and address them.

Course Objectives: At the end of this course, students shall be able to obtain good knowledge of the language, to read, write and speak German, whereby the emphasis is laid on speech. At the end of the first course, the students are in the position to communicate in a basic manner. An example of their skills would be:

- **Ordering food in a restaurant**
- **Expressing their likes and dislikes**
- **Going** for shopping
- **Booking a room in a hotel**
- **Or even making complaints where** ever necessary.

Course Objective :

CO1: Will have a basic knowledge on Foreign Languages, foreign culture and heritage.
CO2: Will able to read and write a foreign language.
CO3: Will get sufficient exposure for developing basic conversational skills.

CO4: Will impart knowledge on foreigh lifestyle.
CO5: Will gain confidence to survive in global environment.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		W	S		M							
CO3		M		S								
CO4	S		M	W								
CO5		W	W									

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

Course structure:

A. German Language (speaking, reading, writing, grammar and test)
B. Life in Germany (shopping, restaurant, doctor, government, bank, post)
C. The German Way (introduction, doing business, conversation, meetings, dining)
D. Germany (Culture, Climate)

UNIT I **9**

Welcome: Introduction to the Language, Spelling and Pronunciation (The alphabets and numbers) Greetings, ordering, requesting, saying thank you - Grammar **– the article "the", conjugation** of
verbs

UNIT II **9**

Shopping - Grammar **–** adjectives, endings before nouns, practice. Self introduction

UNIT III **9**

Addresses, Occupations, Studies - Grammar **- 'to be', the definite/indefinite** articles, individual Training

UNIT IV **9**

Leisure Time, Sports, Hobbies - Grammar – position of a verb in a main clause , oral practice

UNIT V **9**

At a Restaurant, Food and Drink - Grammar – the personal pronoun in the Nominative and Accusative, Narrating an event

TOTAL 45 hours

Resources:

- Sprachkurs Deutsch 1 (Verlag Diesterweg), New Delhi Learning Centre

BJP 101/201 JAPANESE **L T P C 3 0 0 3**

Course Objective:

The student will be able

- To have a basic knowledge of Japanese language, Japanese culture and heritage
- To impart knowledge Japanese lifestyle.
- To give sufficient exposure to develop basic conversational skills.

Course Objective :

CO1: Will have a basic knowledge on Foreign Languages, foreign culture and heritage.
CO2: Will able to read and write a foreign language.
CO3: Will get sufficient exposure for developing basic conversational skills.
CO4: Will impart knowledge on foreigh lifestyle.
CO5: Will gain confidence to survive in global environment.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		W	S		M							
CO3		M		S								
CO4	S		M	W								
CO5		W	W									

Course Assessment Method

Direct	Indirect
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I **9**

Introduction-history and origin of Japanese language-Japan and its cultural heritage-Self introduction-counting numbers (1-100)-time-conversation with the use of audio devices, grammar– usage of particles wa, no, mo and ka

UNIT II **9**

Greetings, seasons, days of the week and months of the year-numbers (up to 99,999)-grammar– usage of kore, sore, are, kono, sono, ano, koko and kochira, arimasu and imasu-i-ending and na-ending adjectives-use of audio and drills for practice

UNIT III **9**

Asking the price–associated vocabulary-usage of particles ni, ga and ne- use of audio and drills for practice-Introduction to basic Kanji characters- use of audio and drills for practice

UNIT IV **9**

Family relationships- colours-Kanji (numbers) and festivals of Japan-religion-Japanese art and culture-ikebana, origami-introduction to hiragana- use of audio and drills for practice

UNIT V **9**

Vocobulary associated with directions-asking way-particles – e, de, mo, koko, soko, asoko, doko, nani, mae, ushiro, ue, shita- use of audio and drills for practice-introduction to katakana

Total: 45 Periods

Text books

1. Japanese hiragana and katakana for beginners, Timothy G. Stout, 2011
2. Genki I: An integrated course in elementary Japanese, Eri Banno and Yuko Ikeda, 2011

Reference Books

1. Japanese Reader collection Volume I, Yumi Boutwell and Clay Boutwell, Kotoba books, 2013

2. Living language Japanese Complete edition begineers through advanced course, Living language, 2012

BKR 101/201 KOREAN **L T P C 3 0 0 3**

Course Objective:

Learning a language is almost akin to a journey of discovery. It not only opens up a whole new dimension but also contributes significantly to the development of an individual's intelligence. Language gives us access and insights into another culture.

It is a fundamental truth that cultures define themselves through languages. Since language is a symbol of culture, the curriculum for all the languages reflects this spirit. To give students some proficiency in the foreign languages like Korean

Course Outcome:

Upon completion of the course, students should be able to manage conversation, reading and writing on the topics related to:

- Holiday and travel
- Shopping
- Feelings, advice and introductions
- Hobbies and job requirements
- Plans and preparations
- Appointments and requests
- Ordering for food, rooms and houses

Course Objective :

CO1: Will have a basic knowledge on Foreign Languages, foreign culture and heritage.
CO2: Will able to read and write a foreign language.
CO3: Will get sufficient exposure for developing basic conversational skills.
CO4: Will impart knowledge on foreigh lifestyle.
CO5: Will gain confidence to survive in global environment.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		W	S		M							
CO3		M		S								

CO4	S		M	W								
CO5		W	W									

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I **9**

Asking/giving reasons for studying Korean, making plans for the holiday, writing letters, describing past travel experiences and future travel plans, shopping in a grocery store, shopping in electronics store, storytelling Grammar: would like to (do), want to (do), construct future tense.

UNIT II **9**

Asking about feelings, asking about problems and giving advice, brief introductions - Grammar: Noun modifier, please try doing (something), irregular adjective/verb

UNIT III **9**

Asking about hobbies, asking about abilities (sports), job requirements, Ordering things for delivery, ordering a meal at a restaurant - Grammar: Sentence ending for the honorific form, please do something for me, have tried (something),

UNIT IV **9**

Asking about evening plans, making plans with others, making preparations - Asking about rooms, describing your room to your classmates, describing your house. Grammar: to know/not know how to do something, must (do), have to (do), should,

UNIT V **9**

Describing your plans and giving reasons, cancelling appointments. Grammar: Shall we~? / Should we~?, with, and, irregular verbs/adjective, so, because, cannot, intend to, plan to, or hope to, (more) than, the most, tag question/is n't it? ,will (do)

Total: 45 Periods

Course Material:

- Korean for Non-Native Speakers(Student Book 1B) Korean Language Education Center, Sogang Univers

BCN 101/201 CHINESE L T P C 3 0 0 3

Aim: To make the learners get acquainted with the language for professional life.

Objective: To enhance the students use this language in day today conversations with ease and confidence.

Course Objective :

CO1: Will have a basic knowledge on Foreign Languages, foreign culture and heritage.
CO2: Will able to read and write a foreign language.
CO3: Will get sufficient exposure for developing basic conversational skills.
CO4: Will impart knowledge on foreigh lifestyle.
CO5: Will gain confidence to survive in global environment.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		W	S		M							
CO3		M		S								
CO4	S		M	W								
CO5		W	W									

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT-1 **9**

History, Origins, Old and middle Chinese, Rise of northern dialects

UNIT-II **9**

Influences 3 Varieties of Chinese. 1.Classification 2.Standard Chinese and diglossia 3.Nomenclature

UNIT-III **9**

Chinese characters, Homophones, Phonology

UNIT-IV **9**

Tones, Phonetic transcriptions, Romanization, Other phonetic transcriptions

UNIT-V **9**

Grammar and morphology, Vocabulary, Loanwords, Modern borrowings and loanwords

Total: 45 Periods

REFERENCES:

- Hannas, William C. (1997), Asia's Orthographic Dilemma, University of Hawaii Press, ISBN HYPERLINK "http://en.wikipedia.org/wiki/Special:BookSources/978-0-8248-1892-0" 978-0-8248-1892-0.

- Qiu, Xigui (2000), Chinese Writing, trans. Gilbert Louis Mattos and Jerry Norman, Society for the Study of Early China and Institute of East Asian Studies, University of California, Berkeley, ISBN HYPERLINK "http://en.wikipedia.org/wiki/Special:BookSources/978-1-55729-071-7" 978-1-55729-071-7.

- Ramsey, S. Robert (1987), The Languages of China, Princeton University Press, ISBN HYPERLINK "http://en.wikipedia.org/wiki/Special:BookSources/978-0-691-01468-5" 978-0-691-01468-5.

- Schuessler, Axel (2007), ABC Etymological Dictionary of Old Chinese, Honolulu: University of Hawaii Press, ISBN HYPERLINK "http://en.wikipedia.org/wiki/Special:BookSources/978-0-8248-2975-9" 978-0-8248-2975-9.

- R. L. G. " Language borrowing Why so little Chinese in English?" The Economist. June 6, 2013.

BME 203 ENGINEERING MECHANICS **L T P C 3 1 0 3**

Objective:

At the end of this course the student should be able to understand

- The vectorial and scalar representation of forces and moments
- Static equilibrium of particles and rigid bodies in two dimensions
- Physical properties of surfaces and solids
- Effect of friction on equilibrium and their application
- Principle of work and energy
- The laws and kinematics of motion of particles and rigid bodies

Course outcomes

CO1: Students will gain knowledge regarding the various laws and principles associated with statics and dynamics statics and to apply them for practical solutions.
CO2: Students will gain knowledge regarding center of gravity and momenta inertia and apply them for practical problems.
CO3: Students will gain knowledge regarding various types of forces and reactions and tom draw free body diagram to quicker solutions for complicated problems.
CO4: Student will gain knowledge in work and energy
CO5: Student will gain knowledge on friction on equilibrium and its application.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		W	S		M							
CO3		M		S								
CO4	S		M	W								
CO5		W	W									

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey

Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT – I Basics and Statics Of Particles **12**

Introduction - Units and Dimensions - Laws of Mechanics **– Lame's theorem, Parallelogram and triangular Law** of forces **–** Vectors **–** Vectorial representation of forces and moments **–** Vector operations on forces - Coplanar Forces **–** Resolution and Composition of forces **–** Resultant of several concurrent forces - Equilibrium of a forces **–** Forces in space - Equilibrium of particle in space - Equivalent systems of forces **–** Principle of transmissibility **–** Single equivalent force.

UNIT – II Equilibrium of Rigid Bodies **10**

Free body diagram **–** Types of supports and their reactions **–** requirements of stable equilibrium **–** Moments and Couples **–** Moment of a force about a point and about an axis **–** Vectorial representation of moments and couples**–** Scalar components of a moment **– Varignon's theorem** - Equilibrium of Rigid bodies in two dimensions - Equilibrium of Rigid bodies in three dimensions.

UNIT – III Properties of Surfaces and Solids **10**

Determination of areas **–** First moment of area and the Centroid of standard sections **–** T section, I section, Composite figures, Hollow section **–** second moments of plane area **–** Rectangle, triangle, circle - T section, I section, Hollow section **–** Parallel axis theorem and perpendicular axis theorem **–** Polar moment of inertia **–** Principal moments of inertia of plane areas **–** Principal axes of inertia **–** Basic concept of Mass moment of inertia.

UNIT – IV Friction **10**

Frictional force **–** Laws of Coloumb friction **–** Cone of friction **–** Angle of repose **–** Simple contact friction **–** Sliding of blocks **–** Wedge friction - Ladder friction **–** Screw Jack **–** Belt friction - Rolling resistance.

UNIT – V Dynamics Of Particles **10**

Displacements, Velocity and acceleration, their relationship **–** Relative motion **–** Relative acceleration **–** Curvilinear motion of particles **– Newton's law –** work energy equation **–** impulse and Momentum **–** Impact of
elastic bodies.

TEXT BOOK:

1. **Beer, F.P and Johnson Jr. E.R, "Vector Mechanics for Engineers**: Vol. 1 Statics and vol. 2 Dynamics**"**, McGraw-Hill International Edition, 2013.
2. Rajasekaran, S, Sankarasubramanian, G., Fundamentals of Engineering Mechanics, Vikas Publishing House Pvt., Ltd., 2011.

REFERENCES :

1. Kumar, K. L Kumar, V., Engineering Mechanics, Tata McGraw – Hill, New Delhi, 2010
2. Palanichamy, M.S., Nagan, S., Engineering Mechanics – Statics & Dynamics, Tata McGraw - Hill, 2013.
3. Timoshenko, and Young, Engineering Mechanics, Tata McGraw-Hill, New Delhi, 2013.
4. Irving H. Shames, Engineering Mechanics – Statics and Dynamics, IV Edition – Pearson Education Asia Pvt., Ltd., 2006.

BEE 201 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

LTPC 2 0 0 2

Objective :

At the end of this course the student should be able to understand

- Electrical laws
- Electrical machines
- Basic measuring sustems and components

Course outcomes

CO1: Students will gain knowledge regarding the various laws and principles associated with electrical systems.
CO2: Students will gain knowledge regarding electrical machines and apply them for practical problems.
CO3: Students will gain knowledge regarding various types semiconductors.
CO4: Student will gain knowledge digital electronics.
CO5: Student will gain knowledge on electronic systems.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
6												

CO1	S											
CO2		W	S		M							
CO3		M		S								
CO4	S		M	W								
CO5		W	W									

Direct	Indirect
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT – I D.C. AND A.C CIRCUITS

Ohm's law – Kirchoff's Laws, V – I Relationship of Resistor (R) Inductor (L) and capacitor (C). Series parallel combination of R, L&C – Current and voltage source transformation – mesh current & node voltage method –superposition theorem – T**hevenin's and Norton's Theorem** - Problems.

UNIT – II ELECTRICAL MACHINES **6**

Construction, principle of operation, Basic Equations and applications - D.C.Generators and D.C.Motors**.** -Single phase Induction Motor - Single Phase Transformer.

UNIT – III BASIC MEASURMENT SYSTEMS **6**

Introduction to Measurement Systems, Construction and Operating principles of PMMC, Moving Iron, Dynamometer Wattmeter, power measurement by three-watt meter and two watt method – and Energy meter.

UNIT IV – SEMICONDUCTOR DEVICES **6**

Basic Concepts of semiconductor devices – PN Junction Diode Characteristics and its Application – HWR, FWR – Zener Diode – BJT (CB, CE, CC) configuration & its characteristics.

UNIT V – DIGITAL ELECTRONICS **6**

Number system – Logic Gates – Boolean Algebra – De-**Morgan's Theorem –** Half Adder & Full Adder – Flip Flops.

TOTAL NO. OF PERIODS: 30

TEXT BOOKS:

1. **N.Mittle "Basic Electrical Engineering". Tata McGraw Hill Edition, New Delhi, 1990.**

2. **A.K. Sawhney, 'A Course in Electrical & Electronic Measurements & Instrumentation',**
   Dhanpat Rai and Co, 2004.
3. Jacob Millman and Christos C-**Halkias, "Electronic Devices and Circuits", Tata McGraw Hill**

REFERENCE BOOKS:

1. Edminister J.A. **"Theory and problems of Electric Circuits" Schaum's Outline Series. McGraw**
   Hill Book Compay, 2nd Edition, 1983.
2. Hyatt W.H and K**emmerlay J.E. "**Engineering Circuit Analysis**", McGraw Hill Internatinal** Editions, 1993.
3. D. P. Kothari and I. J. Nagrath **"** Electric machine**s" Tata McGraw**-Hill Education, 2004
4. **Millman and Halkias, "Integrated Electronics", Tata McGraw Hill Edition,2004.**

BCS 1L1/BCS 2L2 COMPUTER PRACTICE LABORATORY I L T PC 0 0 2 1

Objective :

To enhance the student with basic computer knowledge.

Course outcomes

CO1: Students will able to create their own word documents.
CO2: Students will able to do analyse datas using spreat sheet
CO3: Student will able to understand basic C programing.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S								M			
CO2	S	W	S		M				M			

CO3	S	M		S					M			
CO4												
CO5												

Practical

Direct	**Indirect**
Observation Book	Student Exit Survey
Record Book	Faculty Survey
Model exam	Industry
Viva Voce	Alumni
End semester exam	

LIST OF EXERCISES

A) Word Processing **11**

Document creation,Text manipulation with Scientific Notations. Table creation,Table formatting and Conversion. Mail merge and Letter Preparation. Drawing-Flow Chart

B) Spread sheet

Chart-Line Xy Bar and Pie – Formula-Formula Editor-Spread sheet-Inclusion of Object, Picture and Graphics Protecting the document and sheet-Sorting and Import/Export features.

C) Simple C Programming*

Data types, Expression Evaluation, Condition Statement. Arrays structures and Unions – Functions

D) Simple C++Programming

13. Classes and Objects
14. Constructor and Destructor

***For Programming exercises Flow chart and Pseudo code are essential.**

Total: 45 Periods

BEE2L1 Basic Electrical Engineering Lab **L T P C 0 0 2/2 1**

Objective :

To enhance the student with knowledge on electrical and electronic equipments.

Course outcomes

CO1: Students will able to handle basic electrical equipments.

CO2: Students will able to do staircase wiring.

CO3: Student will able to understand domestic wiring procedures practically.

CO4: Student will able to assemble electronic systems.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1									M			
CO2		W	S		M				M			
CO3		M		S					M			
CO4				W								
CO5												

Practical

Direct	**Indirect**
Observation Book	Student Exit Survey
Record Book	Faculty Survey
Model exam	Industry
Viva Voce	Alumni
End semester exam	

I Practical - List of Experiments for Electrical Engineering Lab

1. Fluorescent lamp wiring
2. Stair case wiring
3. Measurement of electrical quantities-voltage current, power & power factor in RLC circuit
4. Residential house wiring using fuse, switch, indicator, lamp and energy meter
5. Measurement of energy using single phase energy meter
6. Measurement of resistance to earth of electrical equipment

I - List of Experiments for Electronics Engineering Lab

1. Study of electronic components and equipments.
   A. Resistor colour coding using digital multi-meter.

B. Assembling electronic components on bread board.

2. Measurement of ac signal parameters using cathode ray oscilloscope and function generator.
3. Soldering and desoldering practice.
4. Verification of logic gates (OR, AND, OR, NOT, NAND, EX-OR).
5. Implementation of half adder circuit using logic gates.

BPC 2L1 PHYSICS AND CHEMISTRY LABORATORY L T P C 0 0 2/2 1

Objective :

To enhance the student with knowledge on practical physics and chemistry.

Course outcomes

CO1: Students will understand the concept of hall effect

CO2: Students will understand the concept of semiconductors. .

CO3: Student will understand the working of spectrometer.

CO4: Student will able practicaly understand the chemical reactions.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2		W	M		M							
CO3		W		M								
CO4				W								
CO5												

Practical

Direct	**Indirect**
Observation Book	Student Exit Survey
Record Book	Faculty Survey
Model exam	Industry
Viva Voce	Alumni
End semester exam	

I - LIST OF EXPERIMENTS – PHYSICS

1. Determination of resistivity of high resistance alloys and temperature coefficient
2. Study of Hall effect – Hall coefficient determination

3. Determination of electrical conductivity of good conductors
4. Study of magnetic hysteresis and energy product
5. Determination of Band gap of a semiconductor
6. Determination of Dispersive power of a prism – Spectrometer

II - LIST OF EXPERIMENTS – CHEMISTRY

1. Conducto metric titration (Simple acid base)
2. Conducto metric titration (Mixture of weak and strong acids)
3. Conducto metric titration using $BaCl_2$ vs Na_2SO_4
4. Potentiometric Titration (Fe^{2+} / $KMnO_4$ or $K_2Cr_2O_7$)
5. PH titration (acid & base)
6. Determination of water of crystallization of a crystalline salt (Copper Sulphate)
7. Estimation of Ferric iron by spectrophotometer.

BMA 301 ENGINEERING MATHEMATICS - III 3 1 0 4

OBJECTIVES

To equip students with adequate knowledge of Mathematics to formulate problems in Engineering, and solve them analytically.

Course Outcomes:

At the end of this course, students shall be able to

1. Solve PDE of second and higher order with constant coefficients.
2. Expand given functions by using the concept of Fourier series.
3. Solve many of the Engineering models of Heat equations and Wave equations which are PDEs with boundary conditions.
4. Solve many problems in Automobile, Medicine, Electronic Engineering which are differential equations of linear or non-linear.
5. Solve differential equations by Laplace transforms.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		W	S		M							
CO3		M		S								
CO4	S		M	W								
CO5		W	W									

Course Assessment Method

Direct	Indirect
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I PARTIAL DIFFERENTIAL EQUATIONS

Formation - Solutions of standard types of first order equations - Lagrange's Linear equation - Linear partial differential equations of second and higher order with constant coefficients.

UNIT II FOURIER SERIES 12

Dirichlet's conditions - General Fourier series - Half-range Sine and Cosine series - Parseval's identity - Harmonic Analysis.

UNIT III BOUNDARY VALUE PROBLEMS

Classification of second order linear partial differential equations - Solutions of one - dimensional wave equation, one-dimensional heat equation - Steady state solution of two-dimensional heat equation - Fourier series solutions in Cartesian coordinates.

UNIT IV LAPLACE TRANSFORMS 12

Transforms of simple functions - Basic operational properties - Transforms of derivatives and integrals - Initial and final value theorems - Inverse transforms - Convolution theorem - Periodic functions - Applications of Laplace transforms for solving linear ordinary differential equations upto second order with constant coefficients and simultaneous equations of first order with constant coefficients.

UNIT V FOURIER TRANSFORMS 12

Statement of Fourier integral theorem - Fourier transform pairs - Fourier Sine and Cosine transforms - Properties - Transforms of simple functions - Convolution theorem - Parseval's identity.

TOTAL NO. OF PERIODS: 60

Text Books:

1. Kreyszig, E."Advanced Engineering Mathematics"8th Edition, John Wiley and Sons, (Asia) Pvt., Ltd, Singapore, 2000.
2. Monty J.Strauss, Gerald L.Bradley, and Karl L.Smith. "Calculus" 3rd Edn.[Prentice Hall]

University Bookstore, New Delhi.

References:

1. Narayanan, S.Manicavachangam Pillay, T.K.Ramanaiah, G."Advanced mathematics for Engineering Students", Volume2 and 3(2nd Edition), S.Viswanathan (printers & publishers Pte, Ltd.,) 1992.
2. Venkataraman, M.K "Engineering Mathematics" Volumes3-A&B, 13th Edition National Publishing Company, Chennai, 1998.
3. Grewal, B.S.,"Higher Engineering Mathematics" (35thEdition), Khanna Publishers, Delhi2000.
4. George B. Thomas and Ross L.Finney. "Calculus and Analytical Geometry" 9th Edn. Narosa Indian Student Edition, New Delhi.
5. Dennis G.Zill and Warren S.Wright. "Advanced Engineering Mathematics". 3rd Edn. Jones & Bartlett Publishers, UK. 1992.

BME301 KINEMATICS OF MACHINES 3 1 0 4

OBJECTIVE:

- To understand the concept of machines, mechanisms and related terminologies.
- To analyse a mechanism for displacement, velocity and acceleration at any point in a moving link.

Course Outcomes:

CO1: Upon completion of this course, the students can able to apply fundamentals of mechanism for the design of new mechanisms and

CO2: Understand the analysis method for optimum design.

CO3: Understand the importants of friction in machine elements.

CO4: Understand the control mechanism

CO5: Understand gear mechanish and its type

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M	M									
CO2		M	W					M				
CO3		M										
CO4			W				S				M	
CO5		W										

Course Assessment Method

Direct	Indirect
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	

UNIT I INTRODUCTION TO MECHANISMS 12

Introduction-Science of mechanisms-Terms and definitions-Planar, Spherical and spatial mechanisms, Mobility-Classification of mechanisms-Indexing mechanisms, reciprocating mechanism etc. Straight line generators- kinematic inversion- Slider crank chain inversions- Four bar chain inversions- Grashof's law.

Determination of velocities and acceleration in mechanisms- Relative motion method (Graphical) for Mechanisms having turning, sliding and rolling pair.

UNIT II SYNTHESIS OF MECHANISMS 16

Classification of kinematics- Synthesis problems- Chebyshev's spacing, Two point synthesis-Freudenstein method- Four bar mechanism and slider crank mechanism.

Types of cams and followers- Follower motions- Uniform, parabolic, SHM, Cycloidal and polynomial-Synthesis of cam profiles for different followers. Cams with specified contours

UNIT III FRICTION 10

Friction-Types-Application-Inclined plane, Screw jack, Clutch, Brakes Bearings, Journal bearing, Flat pivot bearing, multi collar bearings, Belt & Rope drives.

UNIT IV THEORY OF GEARING 12

Classification of gears, Law of gearing, nomenclature-Forms of teeth, Cycloidal teeth, Involute teeth-Length of path of contact-Length of arc of contact-Contact ratio-Interference and undercutting- Minimum number of teeth to avoid interference- Internal gears- Extended center distance system- Long and short addendum system- Gear trains-Types-Epicyclical gear trains-Automobile differential unit.

UNIT V CONTROL MECHANISMS 10

Governors- Gravity controlled governors-Spring control governors, Hartnell governor, and Hartung governor-Governor characteristics- Governor effort and power.

Gyroscopes-Gyroscopic forces and couple- Forces on bearing due to gyroscopic action-Gyroscopic effects on the movement of aero plans and ships, stability of two wheel drive and four wheel drive.

TOTAL NO. OF PERIODS: 60

Text Books:

1. S.S.Rattan-Theory of Machines- Tata McGraw Hill, 2005.
2. Rao J.S. & Dukkipatti R.V.Mechanisms and Machine Theory, 2nd Edition-Wiley Estern Ltd-1992.

References:

1. Bansal- Theory of Machines, 2006.
2. Shigley.J.E-Theory of Machines and Mechanisms, 2nd Edition- McGraw Hill Inc,1995
3. V.P.Singh-Theory of Machines ,2001

BME302 THERMODYNAMICS 3 1 0 4

OBJECTIVE :

- To achieve an understanding of principles of thermodynamics and to be able to use it in accounting for the bulk behaviour of the simple physical systems.
- To provide in-depth study of thermodynamic principles, thermodynamics of state,basic thermodynamic relations.

Course Outcomes:

CO1: Upon completion of this course, the students can able to apply mathematical knowledge to predict the properties and characteristics of a fluid.

CO 2: Can critically analyse the performance of pumps and turbines.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			M									
CO2	S				M		W					
CO3												
CO4												
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni

Online Test	

UNIT-I BASIC CONCEPTS AND FIRST LAW OF THERMODYNAMICS 12

Concept of continuum, Thermodynamic systems-closed, open and control volume, Thermodynamic properties, path, point functions, process - Quasistatic processes, cycle, work, modes of work, heat, temperature, Zeroth law of thermodynamics, First law of Thermodynamics-applications to open and closed systems, internal energy, Specific heats Cp, Cv, enthalpy,steady and unsteady flow conditions.

UNIT-II SECOND LAW OF THERMODYNAMICS 12

Kelvin's and Clausius statements, Reversiblity, Applications - Carnot cycle, Reversed Carnot cycle, heat engines,Refrigerators, heat pumps, Concept of Entropy, Clausius Inequality, Principle of increase of entropy, Carnot theorem, Entropy and irreversibility, Available energy , Availablity,Gibbs and Helmholtz functions

UNIT III THERMODYNAMIC PROPERTIES OF PURE SUBSTANCES 12

Thermodynamic Properties Of Pure Substances in solid, liquid and vapour phases, P-V, P-T,T-V,T-S,H-S diagrams, PVT surfaces, steam table of thermodynamic properties, Calculations of properties, Work done and heat transferred in non flow and flow processes.

UNIT IV THERMODYNAMIC RELATIONS & GAS LAWS 12

Exact differential,Tds relations, Maxwell, Clausius-Clapeyron equation, Joule Thomson Co-efficent, Avagadro's Law, Vanderwaal's equation of state, mole concept, molar volume, equivalent weight, properties of mixture, Dalton's law of partial pressure, Amagat law, Enthalpy and specific heat, Molecular weight of gas mixture.

UNIT V COMBUSTION OF FUELS 12

Heating value of fuels, Combustion equations, Theoretical and excess air, Air-fuel ratio, Exhaust gas analysis, adiabatic flame temperature.

TOTAL NO. OF PERIODS: 60

Text books:

1. P.K.Nag-Basic and Applied Thermodynamics-Tata McGraw Hill Publishing Company, 2002
2. R.K.Rajput-Engineering Thermodynamics-Laxmi Publications

References:

1. S.C.Somasundaram-Thermal Engineering-New Age International (P) Ltd,1996
2. Y.V.C.Rao-An Introduction to Thermodynamics-New Age International (P) Ltd, 2004
3. Yunus A.Cengel-Thermodynamics-International Edition, 2006

BME303 MECHANICS OF SOLIDS 3 1 0 4

OBJECTIVES

- To gain knowledge of simple stresses, strains and deformation in components due to external loads.
- To assess stresses and deformations through mathematical models of beams twisting bars or combinations of both.

Course Outcomes:

CO 1: Upon completion of this course, the students can able to apply mathematical knowledge to calculate the deformation behavior of simple structures.

CO 2: Critically analyse problem and solve the problems related to mechanical elements and analyse the deformation behavior for different types of loads.

CO3: Understand and analyze stress behavior.

CO4: analyze the behavior of different structure under loading.

CO5: Understand failure conditions

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			M			S						
CO2			M					M	M			
CO3		W										
CO4				M					M			
CO5								W	M			

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	

UNIT I TRUSSES, SHEAR FORCE AND BENDING MOMENT DIAGRAM 12

Analysis of trusses – Method of joints – Method of section – Shear force and Bending moment diagram – cantilever – simply supported – overhanging beams, Relation between load, shear

force and bending moments.

UNITII STRESS AND STRAIN BEHAVIOUR OF SOLIDS 12

Tension, Compression and shear, Normal stress and strain, Statically indeterminate problems – temperature effects – stress and strain diagram – Elasticity – Plasticity, strain energy in tension – Impact loads – Shear stress and strain – Allowable stress – Poisson's ratio – Relation between elastic constants.

PRINCIPAL STRESSES Principal stresses and maximum shear stress – importance of zero principal stress in a three dimensional state of stress – Solution to problems by analytical method, Calculation of principal stress and maximum shear stress for a pressure vessel and shaft.

UNIT III BENDING & TORSION 12

Normal and shear stresses in beams – Torsion of circular shafts – Statically indeterminate torsional members – Torque diagrams, Strain energy in torsion.

UNIT IV DEFLECTION OF BEAMS 12

Slope and deflection of beams – Double integration method – Macaulay's method – Strain energy method for cantilever, simply supported and overhanging beams.

UNIT V THIN AND THICK CYLINDERS 12

Thin cylinder and shells – Volumetric strain – rotational stress in thin cylinders and discs, Thick cylinders – Shrink fit – Compounding of cylinders.

COLUMN AND STRUTS Columns and struts – Eccentric loading of short struts – Euler's Formula – Limitations of Euler's formula – Rankine – Gordon formula – Johnson's Parabolic formula.

TOTAL NO. OF PERIODS : 60

Text Books:

1. Prabhu T.J. – Mechanics of Solids, 2009

References:

1. Gere Timoshenko – Mechanics of materials – CBS, 1997.
2. Beer & Johnson – Mechanics of materials , SI Metric Edition – McGraw Hill, ISE, 2006.
3. Timoshenko & young, Engineering Mechanics – McGraw Hill, 2007.
4. Popov E.P. Engineering Mechanics of solids – PHI, New Delhi,2006.
5. Shames Irvin. H – Introduction to Solid Mechanics – PHI,2002.

BME304 FLUID MECHANICS AND MACHINERY 3 1 0 4

OBJECTIVES

- To achive a understanding of the properties of the fluids. The dynamics of fluids is introduced through the control volume approach which gives an integrated understanding of the transport of mass, momentum and energy.
- The applications of the conservation laws to flow though pipes and hydraulics.

Course Outcomes:

CO 1: Upon completion of this course, the students can able to apply mathematical knowledge to predict the properties and characteristics of a fluid.

CO 2: Can critically analyse the performance of pumps and turbines.

CO3 : Can understand different types of flow.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			M					M		W		
CO2									M	W		
CO3		W										
CO4												
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	

UNIT I FLUID PROPERTIES AND FLUID STATICS 12

Fluid properties –continuity equation-Hydrostatic law-pressure variation in static fluid-hydrostatic force on a submerged plane and curved surface-location of hydrostatic force, manometry, single tube and differential manometers, Buoyancy-Metacentric height.

UNIT II FLUID KINEMATICS AND FLUID DYNAMICS 12

Classification of fluid flow, fluid flow lines, stream lines, streak line and path line, vortex flow, Euler's momentum equation, Bernoulli's equation-application of Bernoulli's equation-Flow measurement, pitot tube, venturimeter

UNIT III FLOW OF A REAL FLUID &FLOW THROUGH PIPES 12

Laminar and turbulent flow, Laminar boundary conditions, Boundary layer thickness, Navier-Stokes equation(statement only),Flow through pipes, Reynolds experiments, Darcy Weisbach equation, pipes in series ,pipes in parallel, siphon losses-Power transmission, Water hammer

UNIT IV DIMENSIONAL ANALYSIS &PUMPS 12

Principle of dimensional Analysis-Buckingham's Π theorem-Important dimensionless numbers applicable to fluid mechanics-Centrifugal pumps, Pump outlet and efficiencies-Cavitations, pump characteristics, multistage pumps, axial flowpumps-characteristics, construction details,Non-dimesnsional parameters-Efficiencies-reciprocating pumps, Indicator diagram-Rotary pumps –Classifications, Working

UNIT V HYDRAULIC TURBINES 12

Classification of hydraulic turbines-pelton turbines, velocity triangle-Efficiency, working, Principle of Pelton wheel, Francis and Kaplan turbines-velocity triangles-Hydraulic turbine characteristics.

TOTAL NO. OF PERIODS: 60

Text books:

1. Modi and Seth-Fluid Mechanics and Hydraulic Machines, 2005.
2. R.K.Bansal- Fluid Mechanics and Hydraulic Machines-Laxmi Publications.

References:

1. Agarwal.S.K.Fluid Mechanics and Machinery-McGraw Hill, 1999
2. Jain.A.K. Fluid Mechanics-Khanna Publishers, 2000
3. D.S.Kumar-Fluid Mechanics and Fluid power Engineering, S.K.Kataria&Sons, 1998
4. Mohanty, Fluid Mechanics, PHI, 2000

BME305 MANUFACTURING TECHNOLOGY-I 3 0 0 3

OBJECTIVES

- To understand the concept and basic mechanics of metal cutting, working of standard machine tools such as lathe, shaping and allied machines, milling, drilling and allied machines, grinding and allied machines and broaching

Course Outcomes:

CO 1: Upon completion of this course, the students can able to apply the different manufacturing process.
CO2: **U**se this in industry for component production
CO3: Will know different machineries.
CO4: Will know different manufacturing processes

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			M				W	M	M			
CO2		W				S		M				
CO3				M								
CO4		W	M									
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	

UNIT I METAL WORKING PROCESS 9

Mechanical working of metals-hot and cold working-rolling, extrusion, spinning, wire- drawing, press working. Welding - different types of gas and arc welding process, soldering and brazing. Casting-different types, furnaces, casting defects and inspection.

UNIT II THEORY OF METAL CUTTING 8

Introduction, mechanics of metal cutting- chip formation, Merchant's circle theory, cutting force calculations, tool materials, Influence of tool angles, tool life, cutting fluids, machining time calculations, Metal cutting economics, problem in merchant circle, tool life, machining time and economics.

UNIT III MACHINING PROCESSES 10

Lathe- introduction, types, construction, mechanisms and attachments for various operations,

nomenclature of single point cutting tool. Capstan and turret lathes: various mechanisms, tool and loading arrangement. Automatic lathes- single spindle and multi spindle mechanisms.

UNIT IV SHAPER, PLANER AND MILLING PROCESS 10

Shaper, planer and slotter : types, specification, mechanisms, holding devices, difference between shaper and planer. Milling machine - types and specification, mechanisms, holding devices, milling operations. Milling tool nomenclature, indexing types-simple, compound and differential.

UNIT V DRILLING, BORING AND BROACHING 8

Drilling, Boring- Specification. Nomenclature of drilling and reaming tool and its specification. Broaching: Specification, types, mechanisms, nomenclature of broaching tool.

TOTAL NO. OF PERIODS: 45

Text Books:

1. P.C. Sharma, A text book of production technology, S.Chand & company ltd., New Delhi, 2007.
2. Hajra Chowdary S K The fundamentals of work shop technology Vol. I &II, Media publishers,1997
3. P.N.Rao. Manufacturing Technology-foundry forging &welding TMH publishing co., New Delhi -2009.

Reference:

1. W.A.J.chapman-work shop technology, vol I,II & III, 1975, ELBS.
2. Roy A Llindberg, Process and material manufacture, PHI, 1995
3. Kalpakjian, manufacturing engineering and technology, Addison Wesley, 2005

BME3L1 MACHINE DRAWING 2 0 3 2

OBJECTIVES

- To make the students understand and interpret drawings of machine Componentsso as to prepare assembly drawings.
- To familiarize the students with Indian Standards on drawing practices and standard components.

Course outcomes

CO1: Students will get good interpretation of machine components

CO2: Students willunderstand standardization of drawings .

CO3: Student will understand the indian and international standard components.

CO4: Student will able create drawings to industrial standard.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S								M			
CO2		W	M		M				M			
CO3		W		M					M	M		
CO4				W								
CO5												

Indian standard code (BIS) of practice for engineering drawing-General principle of presentation, Conventional representation of threaded parts, Springs, Gear and common features, Abbreviations and symbols use in technical drawings.

Tolerance- Types-Symbols used and representation on the drawing - Fit types, Selection for different application- Allowance, Interchangeability. Surface finish- Relation to the manufacturing processes- Types of representation on the drawing- Welding symbols.

Practical

Practical

Direct	**Indirect**
Observation Book	Student Exit Survey
Record Book	Faculty Survey
Model exam	Industry
Viva Voce	Alumni
End semester exam	

Preparation of working drawing for given machine components:

Bolts, Screws, Studs, Nuts, Keys and Key-ways.

Preparation of simple assembly drawings:

Different types of cotter and knuckle joints.

Preparation of simple assembly drawing for following machine with part drawings given: Screw jack, Plummer block, Connecting rod, Machine vice, Tail stock of lathe, Tool head of shaper, fuel injection pump for single cylinder engine, Stop valve.

Text book:

1. Gopala Krishnan, Machine Drawing- Subash publishers, 2001.
2. Bhatt, N.D. Machine Drawing- Charotar publishing House, 2000.

References:

1. Narayana.K.L. Machine Drawing- New age publisher, 2006.

BCE3L3 **FLUID MECHANICS, MACHINERY& STRENGTH OFMATERIALS 0 0 3 2**

OBJECTIVES

Objectives

- To supplement the theoretical knowledge gained in Mechanics of Solids with practical testing for determining the strength of materials under externally applied loads. This would enable the student to have a clear understanding of the design for strength and stiffness

Course outcomes

- **CO1**: Students will understand flow through pipes
- **CO2**: Students will practicaly understand different flow measuring equipment .
- **CO3:** Student will understand the strength of components and testing methods.
- **CO4:** Student will understand the characteristics of pumps.
-

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M								W			
CO2		W	M		M				W			
CO3		W		M					M	W		
CO4				W								
CO5												

- **Practical**

Direct	**Indirect**
Observation Book	Student Exit Survey
Record Book	Faculty Survey
Model exam	Industry
Viva Voce	Alumni
End semester exam	

FLUID MECHANICS LAB

1. Determination of flow through pipes,

losses in pipes.
2. Calibration of orificemeter and venturimeter
3. Flow through notches and weir
4. Flow through open orifice
5. Buoyancy experiment-Metacentric height
6. Impact of jet on vanes-inclined and curved vanes
7. Verification of Bernoulli's equation

FLUID MACHINERY LAB

1. Performance characteristics of Jet pump
2. Performance characteristics of Vane pump
3. Performance characteristics of Centrifugal pump
4. Performance characteristics of Reciprocating pump
5. Performance characteristics of Gear pump
6. Characteristics of Impulse turbine
7. Characteristics of Reaction turbine

STRENGTH OF MATERIALS LAB

1. Tension test of a mild steel rod
2. Double shear test on mild steel and Aluminium rods
3. Torsion test on mild steel rod
4. Hardness test on metals- Brinell and Rockwell hardness
5. Deflection test on helical springs
6. Deflection test on beams
7. Compression test – bricks
8. Double shear test in U.T.M

BMA 402 Numerical Methods 3 1 0 4

OBJECTIVES:

To train the students with Mathematical techniques to solve problems in Engineering with numerical data.

Course Outcomes:

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

CO 1: solves a single equation and a system of linear equations by different methods and get exact solution and iterative solution.

CO2: Interpolate a dependent variable based on a given set of values by a suitable method.

CO 3: Find integral value and differential coefficient based on a given set of values.

CO 4: Solve initial value problem of ODE and boundary value problems of PDE.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium,

W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			M	S		M			M		M
CO2			M									
CO3	M			S						M		
CO4					S		S					
CO5	S									S		

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	

UNIT-1 : Solution of equations and Eigen value problems 12

Iterative method, Newton–Raphson methods for single variable- Solutions of linear system by Gaussian, Gauss-Jordan, Jacobian and Gauss-Siedel methods, Inverse of Matrix by Gauss Jordan method, Eigen value of a Matrix power and Jacobian methods.

UNIT-II: Interpolation(Finite differences) 12

Newton's Divided Difference Formula, Lagrange's Interpolation-Forward and Backward Difference Formula-Stirling's and Bessel's Central Difference Formula.

UNIT-III : Numerical Differentiation and Integration 12

Numerical Differentiation with interpolation polynomials, Numerical Integration by Trapezoidal Simpson's(both 1/3 and 3/8)rule, Double integrals using Trapezoidal and Simpson's rule.

UNIT-IV: Initial value problems for Ordinary Differential Equations 12

Single Step methods, Taylors Series, Euler and Modified Euler, Runge-Kutta methods of first and second order Differential equations, Multi Step methods, Milne and Adam's-Bashforth predictor and corrector method.

UNIT-V: Boundary Value Problems for ODE and PDE 12

Finite difference for the second order Ordinary Differential Equations, Finite Difference solutions for one dimensional heat equations(both Implicit and Explicit), One Dimensional wave equation, Two Dimensional, Laplace and Poisson Equation.

TEST BOOKS:

1. Sastry.SS “Introductory Numerical Methods” PHI, 2010
2. Jain K.K. Iyengar, S.R.K and Jain, R.K. “Numerical Methods for Scientific and Engineering Computation” 3rd edition, New Age International Publications and Co. 1993.

References

1. Grewal, B.S. “Higher Engineering Mathematics (36th edition)” Khanna Publication Delhi 2001.
2. M.K. Venkatraman, “ Numerical Methods”, NPC, Chennai.
3. Curtis F.Gerald. “Applied Numerical Analysis” 7th Edn. Pearson Education, Chennai-600113. 2007
4. Dennis G.Zill and Warren S.Wright. “Advanced Engineering Mathematics”. 3rd Edn. Jones & Bartlett Publishers, UK. 1992.

BME401 DYNAMICS OF MACHINES 3 1 0 4

OBJECTIVES:

- To understand the method of static force analysis and dynamic force analysis of mechanisms
- To study the undesirable effects of unbalances in rotors and engines.

Course Outcomes:

CO 1: Upon completion of this course, the Students can able to predict the force analysis in mechanical system and related vibration issues.

CO2: Can able to solve mechanical system problem.

CO3: can able to solve vibration problems

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M				M		S				
CO2		M							W	M		
CO3		M										
CO4												
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey

Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	

UNIT I FORCE ANALYSIS OF MECHANISMS 12

Static, Inertia and combined force analysis- Graphical and analytical method- Slider crank mechanism and four bar mechanism. Turning moment diagram and flywheel-Applications in engine, Punching presses.

UNIT II BALANCING 12

Static and dynamic balancing-Balancing of rotating masses- Balancing of several masses in different planes.Primary and secondary unbalanced forces of reciprocating parts-Balancing of in line engines- Firing order- Balancing of 'V' and 'W' engines.

UNIT III FREE VIBRATIONS OF SINGLE DEGREE OF FREEDOM SYSTEMS 12

Fundamentals of vibrations- Undamped free vibrations of single d.o.f systems–Derivation & solution of differential equation-Torsional Vibrations-single rotor- Equivalent stiffness of spring combinations-Bifilar, Trifilar suspensions-Compound pendulum-Types of damping-Damped free vibrations of single d.o.f-over, critical, under damped- Damping coefficient - Critical damping coefficient-Logarithmic decrement

UNIT IV FORCED VIBRATIONS OF SINGLE DEGREE OF FREEDOM SYSTEMS 12

Forced vibrations with-Constant harmonic excitation-Rotating & Reciprocating unbalance-Excitation of the support-Energy dissipated by damping-Forced vibrations with couloumb, viscous damping-Vibration Isolation and Transmissibility- Vibration Absorbers

UNIT V CRITICAL SPEEDS AND SHAFTS WITH ROTORS 12

Lateral vibration of beams - Whirling speed of shaft - Shafts with two & three rotors-Geared system. Dunkerly's method for different types of beams & shaft with several loads.

TOTAL NO .OF PERIODS: 60

Text Books:

1. R.S.Khurmi-Theory Of Machines-S.Chand Publications.

2. S.S.Rattan-Theory of Machines- Tata McGraw Hill, 2005.

References:

1. Rao.J.S. and Dukkipatti, Mechanism and Machines Theory, 2nd Edition-Wiley Eastern Ltd, 1992.
2. Groover.G.K. Mechanical Vibrations- Nemchand & Bros., 2001.
3. Singh.V.P. Mechanical Vibrations-Dhanpatrai & co (p) Ltd, 2005

BME402 THERMAL ENGINEERING - I 3 1 0 4

OBJECTIVES:

- To integrate the concepts, laws and methodologies from the first course in thermo dynamics into analysis of cyclic processes
- To apply the thermodynamic concepts into various thermal application like IC engines, Steam Turbines, Compressors and Refrigeration and Air conditioning systems

Course Outcomes:

CO 1: Upon completion of this course, the students can able to apply the different gas power cycles

CO2: Use of them in IC and R&AC applications.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		W			S			M				
CO2		M	W			W			W	W		
CO3												
CO4												
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni

Online Test	

UNIT I STEAM NOZZLES 12

Flow of steam through nozzles, Shape of nozzles, Effect of friction, Critical pressure ratio, Super saturated flow

UNIT II STEAM TURBINES 12

Working principles, Simple impulse(De laval) turbine, Reaction turbine, velocity and pressure compounded turbines, Height of blades of turbines, multi stage turbine, Radial flow turbines, Governing of steam turbines(Derivations not included)

UNIT III AIR POWER CYCLES 12

Construction & working of 2 stroke and 4 stroke engines, Otto, Diesel and dual cycles-air standard efficiency, Mean effective pressure and power, Brayton with reheat, intercooling and regeneration, Erricson, Stirling, Atkinson cycles.

UNIT IV VAPOUR POWER AND COMBINED CYCLES 12

Rankine, Modified Rankine, Reheat, Regeneration cycles, Binary vapour power cycles, Cogeneration principles & Applications.

UNIT V REFRIGERATION CYCLES 12

Air refrigeration cycles, Vapour compression refrigeration cycle, sub cooling and superheating cycles, vapour absorption cycles.

TOTAL NO. OF PERIODS: 60

Text Book:

1. R.K.Rajput, Thermal Engineering, Dhanpat Rai publishers, 2008
2. S.Domkundwar-Thermal Engineering-Dhanpat Rai publishers,2000

References:

1. P.K.Nag, Basic & Applied Thermodynamics-Tata McGraw Hill, 2002
2. Yunus A.Cengel-Thermodynamics-International Edition, 2006

BME403 INDUSTRIAL METALLURGY 3 0 0 3

OBJECTIVES

- To impart knowledge on the structure, properties, treatment, testing and applications of metals and non-metallic materials so as to identify and select suitable materials for various engineering applications.

Course Outcomes:

CO 1: Upon completion of this course, the students can able to apply the different materials, their processing, heat treatments in suitable application in mechanical engineering fields.

CO2: student can select materials appropriately for any application.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M	W								M	
CO2		M		M								M
CO3												
CO4												
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	

UNIT I CRYSTALLOGRAPHY 12

Structure of metals and alloys – Molecules and bonding – Crystal structure inter atomic distance and ionic radii, polymorphism, Miller indices of atomic planes, Bragg's law, crystal defects – point, line and plane defects – Effect of crystal imperfection on mechanical properties-strengthening mechanism for improvement of mechanical properties – Allotropy, grain and grain boundaries – problems.

UNIT II MECHANICAL PROPERTIES AND ELASTIC DEFORMATION 12

Mechanical properties: Stress strain curve- elastic deformation – characteristics of elastic deformation – Atomic mechanism of elastic deformation – elastic deformation of an isotropic material – Modulus of elastic resilience. **Elastic deformation:** strain time curves – Damping

capacity – viscous deformation – Plastic deformation – Dislocation and stress – strain curves, Schmid's law. Critical resolved shear stress, Work hardening, Grain boundary hardening, solution hardening, Dispersion hardening.

UNIT III FRACTURE AND ITS PREVENTION 12

Mechanism of brittle fracture – ideal fracture stress (Griffith's theory) – Ductile fracture-Difference between brittle and ductile fracture – fracture toughness – Cup and cone type of fracture – fatigue failure and its prevention – Creep – various stages in creep curve – factors affecting creep resistant materials – Mechanism of creep fracture.

UNIT IV METALLURGY, FERROUS AND NON FERROUS ALLOYS 12

Metallurgy: Solid solution – Intermetallic compound – Cooling curves – Non equilibrium – Phase rule – Interpretation of equilibrium diagram of Cu-Ni, Cu –Zn, Cu – Sn, Cu –Al.

Ferrous alloys: Phase diagram and its significance – Allotropy and phase change of pure iron – steel and cast iron classifications – Equilibrium diagram for iron –Carbon, Microstructure representation for iron and steel – Application of ferrous alloys – Factors affecting mechanical properties. **Heat treatment:** Definition – annealing and normalizing. Types of annealing.TTT diagram – cooling curves superimposed on I.T. diagram. Hardenability, Jominy end quench test, Austempering, mar tempering.

UNIT V SURFACE ENGINEERING 12

Surface heat treatment – Diffusion methods – Carburizing – Nitriding – Cyaniding and carbonitriding – Applications – Thermal methods – flame hardening – induction hardening and their applications – Laser surface hardening–Vickers's Hardness test.

TOTAL NO. OF PERIODS : 60

Text Books:

1. G.E.Dieter, Mechanical Metallurgy, McGraw Hill ISE, 1999.
2. Raghavan, Material Science and Engineering, Prentice Hall of India Pvt. Ltd., 2004.

References:

1. D.Callister-Material Science And Engineering.
2. Arumugam, M.Material Science, Anuradha Publishers, 1997.
3. R.A.Flinn & P.K.Trojan, Engineering Materials and their Applications
4. Rajan, T.V. Sharma and Ashok Sharma, Heat Treatment – Principles and their techniques, Prentice Hall of India Pvt. Ltd., 2004.

BME 404 ENGINEERING METROLOGY AND INSTRUMENTATION 3 0 0 3

OBJECTIVES:

- To understand the basic principles of measurements
- To learn the various linear and angular measuring equipments, their principle of operation and applications

Course Outcomes:

CO1 : Upon completion of this course, the Students can demonstrate different measurement technologies

CO2: use of different measuring methods in Industrial environment.

CO3: Understand the application of LASER in measurement

CO4:Student will know the advance measuring methods

CO5: Understand the applications of computer in measurement

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M	W									
CO2		S	W									
CO3		W				W						
CO4			M				M					
CO5		W										

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	

UNIT I INTRODUCTION TO MEASUREMENTS – LINEAR, ANGULAR 12

Basic concepts of measurement–need of measurement–precision and accuracy –Reliability–Errors in measurement–causes–types, Engineering component measurements – comparators – mechanical & pneumatic–Limit gauges – slip gauges – Sine bar – dial gauge – Rollers – Design – Applications – Angle dekkor – Auto collimator – Alignment telescope.

UNIT II FORM MEASUREMENT AND LASER IN METROLOGY 12

Form measurement – Measurement of tooth thickness – gear tooth vernier – Surface finish measurement – radius measurement – flatness and roundness measurement – Screw thread and gear Measurement.

Laser Metrology: Precision instrument based on laser – Principle – Application of laser – Laser interferometer – Applications in linear measurement and angular measurement – Application in testing of machine tools by Laser interferometer.

UNIT III RECENT ADVANCEMENT AND DEVELOPMENT METROLOGY 12

Coordinate Measuring Machine – constructional features – types – Applications of CMM – CNC. CMM applications – Inspection by computer aided – machine vision – Applications in Metrology

UNIT IV MECHANICAL INSTRUMENTATION AND INSTRUMENTS 12

Generalized measurement system and its functional elements, primary, secondary and working standards. Instrument characteristics, static and dynamic characteristics classification – zero, first and second order instruments and responses, problems. Sensors and transducers – mechanical detector – transducer elements, electrical transducers – Thermoelectric transducer – variable inductance transducers – capacitor transducers – preamplifiers – charge amplifiers – Piezo electric transducers – strain gauges – bridge circuits (quarter, half and full activated), sensitivity – filters – attenuators – D'arsonval – CRO – Oscillographs – recorders – microprocessor based data logging.

UNIT V MEASUREMENT SYSTEMS 12

Force measurement – Torque measurement – Pressure measurement – Flow measurement – Temperature measurement – Vibration Measurement.

TOTAL NO OF PERIODS : 60

Text Books:

1. R.K.Jain Engineering Metrology , Khanna Publishers, 2005
2. Kumar D.S Mechanical Measurement and Control – Metropolitan Book company Pvt. Ltd. – 1989

References:

1. T.G.Beckwith and N.Lewis Buck, Mechanical Measurements, Addison Wesley, 2001
2. Sirohi, R.S. and Radhakrishnan, H.C.Mechanical Measurements, New Age, 1994.

BCE406 ENVIRONMENTAL STUDIES 3 0 0 3

OBJECTIVES:

- The aim of this course is to create awareness in every engineering graduate about the importance of environment, the effect of technology on the environment and ecological balance and make them sensitive to the environment problems in every professional Endeavour that they participates.

Course Outcomes:

CO 1: Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.

CO 2: Public awareness of environmental is at infant stage.

CO 3: Ignorance and incomplete knowledge has lead to misconceptions

CO4: Development and improvement in std. of living has lead to serious environmental disasters

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		W	M					S				
CO2												
CO3			W				M					
CO4		W										
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	

UNIT I THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Definition, Scope and importance, Need for public awareness

NATURAL RESOURCES: RENEWABLE AND NON RENEWABLE RESOURCES:

Natural resources and associated problems.

a) Forest resources: Use and over – exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
b) Water resources: Use and over- utilization of surface and ground water, floods, drought, conflicts over water, dams- benefits and problems.
c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
d) Flood resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
e) Energy resources: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources, case studies.
f) Land resources: Land as a resources, land degradation, man induced landsides, soil erosion and desertification.

Role of an individual in conservation of natural resources, equitable use of resources for sustainable lifestyles.

UNIT II ECOSYSTEMS

Concepts of an ecosystems structure and function of an ecosystem, producers, consumers and decomposers, Energy flow in the ecosystem. Ecological succession, Food chains, food webs and ecological pyramids, introduction, types, characteristics features, structure and function of the following ecosystem: Forest ecosystem, grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, oceans, estuaries)

UNIT III BIODIVERSITY AND ITS CONSERVATION

Introduction- Define, genetic, species and ecosystem diversity, biogeographically classification of India, Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega diversity nation , hot spots of biodiversity. Threats to biodiversity, habitat loss, poaching of wildlife, Conservation of biodiversity: In-situ conservation of biodiversity, Biocomposites.

ENVIRONMENTAL POLLUTION

Definition, Causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, thermal pollution Nuclear hazards. Solids waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution, Pollution case studies. Diaster management : floods, earthquake, cyclone and landslides, Green Engineering.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT

From Unsustainable to Sustainable development, urban problems related to energy, water conservation, rain water harvesting, watered management, Resettlement and rehabilitation of people; its problems and concerns. Case studies, Environmental ethics: Issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion nuclear accident and holocaust. Case Studies. Wasteland reclamation, Environment protection Act, Air (prevention and control of pollution) Act, Water (Prevention and control of pollution) Act, Wildlife protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT

Population growth, variation among nations, population explosion family Welfare Programme, Environment and human health, Human rights, Value Education HIV/AIDS, Woman and Child Welfare, Role of Information Technology in Environment and human health. Case Studies.

FIELD WORK

Visit to a local area to document environment assets – river forest/grassland/hill mountain, Visit to a local polluted site-rural/Industrial/Agricultural. Study of common Plants, insects, birds, Study of simple ecosystems-ponds, river, hill slopes, etc. (Field work Equal to 5 Lecture hours)

BME4L1 METROLOGY & METALLURGY LAB 0 0 3 2

OBJECTIVES

- To make the students understand the concept of standardization and interchangeblity
- To familiarize the students with metallographion structures of different .

Course outcomes

CO1: Students will understand accuracy and precision

CO2: Students will get aware about different measuring equipments .

CO3: Student will get experience in handling metallurgical microscope .

CO4: Student will understand metallographic structures of different materials.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M								W			
CO2	M		M		M				W			
CO3				M						M		
CO4				W								
CO5												

Practical

Direct	**Indirect**
Observation Book	Student Exit Survey
Record Book	Faculty Survey
Model exam	Industry
Viva Voce	Alumni

Metrology Laboratory

1. Estimation of accuracy of instruments-vernier and micrometer.
2. Calibration of dial gauge, micrometer and vernier.
3. Measurement of angles using sine bar, bevel protractors, spirit level.
4. Measurement of gear tooth thickness by various methods including profile projector.
5. Measurement of effective diameter, pitch and helix angle of screw threads by profile projector.

Metallurgy Laboratory

1. Study of metallurgical microscope
2. Preparation of specimen for metallographic observation of white Cast Iron, Grey Cast Iron, Malleable Iron.

3. Preparation of specimen for metallographic observation of Mild Steel, Low Carbon Steel, Medium Carbon Steel, Tool Steel, High speed Steel, and Stainless steel.
4. Preparation of specimen for metallographic observation of Copper-bronze, Copper brass.

BME4L2 MANUFACTURING TECHNOLOGY LAB – I 0 0 3 2

OBJECTIVES

- To make the students aware about different manufacturing machines.

Course outcomes

CO1: Students will understand lathe and its working

CO2: Students will get aware about different tools used in manufacturing .

CO3: Student will understand the concept of tool wear..

.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1									S			
CO2		W	M		M				S			
CO3				M						M		
CO4												
CO5												

Practical

Direct	**Indirect**
Observation Book	Student Exit Survey
Record Book	Faculty Survey
Model exam	Industry
Viva Voce	Alumni
End semester exam	

1. Study of Centre, Capstan and Automatic lathes and their accessories.
2. Exercise on Plane turning and Step turning
3. Exercise on taper turning and knurling
4. Exercise on Eccentric turning
5. Exercise on thread cutting and grooving

6. Exercise on drilling and reaming
7. Exercise on drilling and boring
8. Determination of cutting forces in turning using tool dynamometer.
9. Determination of tool wear using tool makers microscope.

BME4L3 TECHNICAL SEMINAR – I 0 0 2 1

Objective: To make them master the techniques of professional communication so that they become employable after completing the course.

Course outcomes:

CO1: After the completion of the course the students can communicate without any inferior complex
CO2: They can answer the questions asked in the campus interview without any difficulty
CO3: They very well can manage the abroad job situations.
CO4: They will become effective communicators once the course is completed.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						W						
CO2		W	M		M							
CO3	W			M			W			M		
CO4												
CO5												

Practical

Direct	**Indirect**
Observation Book	Student Exit Survey
Record Book	Faculty Survey
Model exam	Industry
Viva Voce	Alumni
End semester exam	

During the Seminar session each student is expected to prepare and present a topic on engineering/ technology for a duration of about 8 to 10 minutes. In a session of three periods per week, 15 students are expected to present the seminar. A faculty guide is to be allotted and he/she will guide and monitor the progress of the student and maintain attendance also.

Students are encouraged to use various teaching aids such as over head projectors, power point presentation and demonstrative models. This will enable them to gain confidence in facing the placement interviews.

*Practice for writing of Technical article.

BME501 MACHINE DESIGN - I 3 1 0 4

OBJECTIVES:

- To understand the principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements.
- To learn & use standard practices and standard data of design parameters.

Course Outcomes:

CO 1: Upon completion of this course, the students can able to successfully design machine components.

CO2: Will understand optimum design procedure.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S	M									
CO2		S	M						M	M		
CO3												
CO4												
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	

UNIT I FUNDAMENTALS 12

Design process – Engineering Materials and Mechanical properties – Eccentric loading – Principal stresses – Design criteria – Calculation of permissible stress – Failure theories – Stress Concentration – Design for variable loading –Soderberg, Goodman and Gerberg relations - Introduction to Fracture Mechanics. Introduction to Optimum Design

UNIT II DESIGN OF SHAFTS 12

Design of Shafts using fatigue factors – Shafts carrying pulleys gears – overhanging and simply Supported Shafts - Hollow shafts - Design of Axles.

UNIT III DESIGN OF SPRINGS 12

Design of tension and compression Helical springs – Springs for Buffers – Springs for impact loads – Concentric springs - Springs in series and parallel connection –Design of Leaf springs – Semi elliptical cantilever type.

UNIT IV DESIGN OF RIVETED & WELDED JOINTS 12

Design of riveted joint for a Boiler – Lozenge joint – Design of eccentrically loaded riveted joints – Design of Welded joints.

UNIT V DESIGN OF BOLTED JOINTS & COUPLINGS 12

Design of eccentrically loaded bolted joints – Screw fastenings – Gasket joints for cylinders – Design of Rigid couplings, Pin and Bush type flexible couplings, Muff coupling and Clamp coupling.

TOTAL NO. OF PERIODS : 60

Text Books :

1. Prabhu T.J. – Fundamentals of Machine Design, 2009.

References :

1. Bhandari V.B – Design of Machine Elements - Tata McGraw Hill, 2007.
2. Shigley J.E. & Misheka – Mechanical Engineering Design2004 – McGraw Hill,2007.
3. Dobrovolosky, Machine Elements – Mir Publications, 1978.
4. Pandya & Shah – Elements of Machine Design, 2000.
5. Design Data, PSG College of Technology, 2007.

BME502 THERMAL ENGINEERING-II 3 1 0 4

OBJECTIVES:

- To apply the thermodynamic concepts into various thermal application like IC engines, Steam Turbines, Compressors and Refrigeration and Air conditioning systems

Course Outcomes:

CO 1: Upon completion of this course, the students can able to understand IC engines , Air compressor.

CO2: Will get knowledge on air conditioning

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		W	M						M			
CO2		W			W				M			
CO3												
CO4												
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	

UNIT I I.C. ENGINES 12

S.I.Engines-Simple carburetor- Idling, cruising and power range-MPFI system, Principles of Turbo charging, Ignition systems-Battery ignition and magneto ignition systems-Combustion-detonation factors and remedy – Pollution control norms. C.I Engines-Fuel injection systems, Combustion knocking factors and remedies Rating of fuels, Cooling and lubrication of I.C Engines.

UNIT TESTING OF I.C. ENGINES 12

Indicated power and Brake power, Mean effective pressure, Efficiencies, Morse test, Determination of torque, Brake power and Brake mean effective pressure, Specific fuel consumption, Brake thermal efficiency and different efficiencies, Performance curves and effect of various parameters on the performance of the engine.

UNIT III AIR COMPRESSORS 12

Reciprocating compressor-Multistage compression-Effect of clearance, volumetric efficiency, Rotary compressors, vane type, Root blowers, Screw compressors, Centrifugal compressors.

UNIT IV PRINCIPLES OF GAS DYNAMICS 12

Types of Jet engines, turbojet, ramjet, pulsejet. Aircraft propulsion theories, Parameters affecting flight performance, Thrust Augmentation, Types of Rocket engines.

UNIT V AIR CONDITIONING 12

Introduction to Psychrometry-Psychrometric chart-Psychrometric processes-summer and winter air conditioning, SHF, RSHF, GSHF, ESHF, Simple calculations used in psychrometry, Components used in air conditioners.

TOTAL NO. OF PERIODS: 60

Text Books:

1. S.C.Somasundaram-Thermal Engineering-New Age International (P) Ltd, 1999.
2. C.P.Arora-Refrigeration & Air conditioning, 2000
3. R.K.Rajput-Engineering Thermodynamics-Laxmi Publications

References:

12. Mathur and Mehta, Thermal Engineering-Jain brothers, 1998
3. Ramalingam-Internal combustion engines-SciTech publications, 2003
4. YahyaS.M-Fundamantals of Compressible flow,New Age International(P)NewDelhi, 2008
5. Cohen H, Rogers GFC, Saravanamuttoo HIH, Gas Turbine Theory, Addison Wesley Longman Ltd, 2007

BME503 FLUID POWER SYSTEMS 3 0 0 3

OBJECTIVES:

- To know the advantages and applications of Fluid Power Engineering and Power Transmission System.
- To learn the Applications of Fluid Power System in automation of Machine Tools and others Equipments.

Course Outcomes:

CO 1: Identify hydraulic and pneumatics components.
CO 2: Ability to design hydraulic and pneumatic circuits

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M	M	M		W						
CO2		M	M									
CO3												

CO4												
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	

UNIT 1 GENERAL INTRODUCTION AND CONTROL SYSTEM COMPONENTS 9

Introduction to Fluid Power, Advantages, Applications –Fluids – Properties of Fluids - Basic Principle of Fluid Power. Hydraulic pumps, Classification Performance, characteristics, pump selection, - Hydraulic Actuators-Linear, Rotary, Selection, and Characteristics. Control system components-Hydraulic valves – Pressure, Flow, and Direction control - Applications

UNIT II HYDRAULIC CIRCUITS 9

Fluid power symbols - Hydraulic circuits - Location of Flow control valves
Regenerative, Synchronizing, Sequencing, Intensifier- Accumulator– Types, Applications

UNIT III HYDRAULIC CIRCUIT DESIGN 8

Design of Hydraulic circuits - selection of components - Hydraulic circuit for shapers, Surface Grinding machine Vertical milling machine, Forklift ,Hydraulic press, Safety circuits -Automatic reciprocating system, Robot Arm – Hydrostatic Transmission – Power Pack.

UNIT 1V PNEUMATIC SYSTEMS 10

Basic concepts and principles of pneumatic circuits, Relative merits and demerits over hydraulic Systems, Pneumatic conditioners – filters, regulators, lubricators, mufflers, Air dryers. Pneumatic actuators, pneumatic circuits, Hydro Pneumatics- Pneumatic logic controls, Electro hydraulic systems – Servo Systems

UNIT V DESIGN & SELECTION 9

Design of pneumatic circuits – classic – cascade – step counter – selection criteria for pneumatic components – PLC applications in fluid power control. Installation and Maintenance of Hydraulic and Pneumatic power packs – fault finding – principles of low cost automation, case studies.

TOTAL NO OF PERIODS: 45

Text Books:

1. Andrew Parr, Hydraulics And Pneumatics (HB), Jaico Publishing House, 2005
2. R.Srinivasan, Hydraulic and Pneumatic Controls, Second Edition, Vijay Nicole Imprints PVT, 2006.

References:

1. Anthony Esposito, Fluid Power with applications – Prentice Hall, 2006
2. Dudleyt A. Pease and John j. Pippenger, Basic Fluid Power, Prentice Hall, 1987.
3. Jamco L.Johnson, Introduction to fluid Power, Eswar Press, 2003.
4. Majumdar S.R,"Pneumatic systems-Principles and Maintenance", Tata McGraw Hill, 1995.

BME504 AUTOMOBILE ENGINEERING 3 0 0 3

OBJECTIVES:

- To understand the construction and working principle of various parts of an automobile.
- To have the practice for assembling and dismantling of engine parts and transmission system

Course Outcomes:

CO1: Upon completion of this course, the students will be able to identify the different components in automobile engineering.

CO2 : Have clear understanding on different auxiliary and transmission systems Usual.

CO3 : Will know the possibility of alternate fuel.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	PO11	PO12
CO1			M						S	M		
CO2		S									M	M
CO3		M										
CO4			W						M			
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey

Seminar	Industry
Quiz	Alumni
Online Test	

UNIT I VEHICLE STRUCTURE AND ENGINES 9

Vehicle construction – Chassis, frame and body- Engine types-Construction-Operation-Turbo and Supercharger engine. Cylinder arrangements-Performance& balancing-engine locations-engine trouble shooting-Pollution norms-Catalytic converter-Indian &Euro emission standards.

UNIT II TRANSMISSION SYSTEMS 9

Clutches-types & Construction- fluid coupling-types-torque converter-Advantages-gear box-types-advantages-gear ratios-automatic transmissions-propeller shaft-universal joint-slip joint-Differential-rear axle. Brakes -Types-Mechanical, Hydraulic, Pneumatic, Power brake. Details of components.

UNIT III STEERING AND SUSPENSION SYSTEMS 9

Principle of steering-Steering geometry and wheel alignment-Steering linkages- Power steering-Wheel and tyres-Construction-Types and specification-Tyre wear and causes-Front and rear axle, Suspension Systems – Needs and Types-Springs-Torsion bar-Shock Absorber.

UNIT IV ENGINE AUXILLARY SYSTEMS 9

Carburetors-Electronic fuel injection systems-Single and multi points types-Principles of modern electrical systems-battery-Dynamo-Alternator-Starting motor-Lighting and ignition(Battery and Electric systems)-Automobile air conditioning.

UNIT V ALTERNATIVE FUELS 9

Alternative fuels-Hydrogen-Compressed natural gas(CNG)-Liquefied petroleum gas (LPG), Fuel cells, Electric hybrid vehicle.

TOTAL NO.OF PERIODS : 45

Text Book:

1. Kirpal Singh, Automobile Engineering, Vol 1 and 2 –Standard Publications, 2004.

References:

1. R.B.Gupta, Automobile Engineering, Satya Prakashan, 2007.
2. Ganesan. V.”Internal Combustion Engines”,TMH,2003
3. K.K.Ramlingam,”Automobile Engineering”, 2002.

BME505 MANUFACTURING TECHNOLOGY-II 3 0 0 3

OBJECTIVES

- To understand the concept and basic mechanics of metal cutting, working of standard machine tools such as lathe, shaping and allied machines, milling, drilling and allied machines, grinding and allied machines and broaching
- To understand the basic concepts of non-traditional machining processes.

Course Outcomes:

CO1: Upon completion of this course, the students can able to understand and compare the functions and applications of different metal cutting tools

CO2: TO demonstrate the programming in CNC machining

CO3: Upon completion of this course, the students can able to apply the different metal removing ,finishing and super finishing and for component production.

CO4:Upon completion of this course, the students can able to understand and compare the functions and applications of different metal cutting tools in gear manufacturing.

CO5: Better understanding on the theoretical background of metal removal process and product preparation by using non-conventional machining processes.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			M					W				
CO2	M	W							S			
CO3								M			M	
CO4		M										
CO5			S									

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	

UNIT I SURFACE FINISHING PROCESS 12

Surface finishing processes: grinding process, types of grinding machine, work holding devices, grinding wheels and specification. Mounting and balancing of grinding wheel. Fine finishing processes: honing, super finishing, polishing, buffing, metal spraying, galvanizing and electroplating.

UNIT II GEAR AND GEAR MANUFACTURING 12

Gear milling, gear shaping, gear planning, gear hobbing. Gear broaching for various types of gears. gear stamping process, cold drawing process, rolling process, sintering process, gear finishing-gear shaving, gear grinding, gear lapping, gear honing**.**

UNIT III NON-TRADITIONAL MACHINING PROCESSES 12

Non-traditional machining techniques, classification. Abrasive jet machining, Electrical Discharge machining, E.D wire cutting, Electro chemical machining, Electron Beam Machining, Laser Beam Machining, Ultrasonic Machining – process parameters, process capabilities, application.

UNIT IV HIGH ENERGY RATE FORMING PROCESS (HERF) 12

Explosive forming, Electro hydraulic, Electro magnetic forming, Dynapack machine – process parameters, process capabilities, application**.**

UNIT V PLASTIC MATERIALS AND PROCESSES 12

Types of plastics, types of Moulding, compression Moulding, transfer Moulding, injection Moulding, blow Moulding, film and sheet forming, thermo forming, reinforced plastic, laminated plastics.

TOTAL NO. OF PERIODS: 60

Text Books:

1. P.C. Sharma, A text book of production technology, S.Chand & company ltd., New Delhi, 2007
2. Hajra chowdary S.K. The fundamentals of work shop technology. vol. I &II, Media publishers, 1997

References:

1. W.A.J.Chapman - Work shop technology, vol I,II & III, 1975, ELBS.
2. Roy.A.Lindberg, Processes and material manufacture, PHI, 1995
3. Kalpakjian, Manufacturing engineering and technology, Addison Wesley, 2005
4. P.N.Rao. Manufacturing technology - foundry forging & welding, TMH., New Delhi -2009

BME506 ELECTRONICS FOR MECHANICAL SYSTEMS 3 0 0 3

OBJECTIVES

- To enable the students to understand the fundamental concepts of Semi Conductors, Transistors, Rectifiers, Digital Electronics and 8085 Microprocessors

Course Outcomes:

CO1: Upon completion of this course, the students can able to design mechatronics system with the help of Microprocessor,

CO2: Also using PLC and other electrical and Electronics Circuits.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	PO11	PO12
CO1	W		M						M			
CO2		M							M			
CO3												
CO4												
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	

UNIT I DIGITAL ELECTRONICS 9

Basic logic Gates - Application of logic gates – De-Morgan's theorem-Boolean Expression-Minimization of Boolean expression-Minterm - Maxterm-Sum of Products(SOP)-Product of Sum(POS)–K-MAP- Digital Comparators – Code Converter – Adders – Sequential logic – Flip flops – SR/JK/D – Counters – Synchronous and Asynchronous – Shift registers – Memory I.C's – RAM, ROM, EPROM – Multiplexers – Demultiplexers - Decoders – Encoders.

UNIT II SIGNAL GENERATORS 9

Operational Amplifier / Inverting / Noninverting / Summing / Integrating / Differential / Logarithmic – Bridge Measurements-Maxwell,Hay,Schering,Andeson,Wein bridge,Wheat Stone Bridge - Comparison of Analog& Digital Techniques, Electronic multimeter,Function generator-Pulse and Square wave Generator-Harmonic Distortion

UNIT III 8085 ARCHITECHTURE 9

Block diagram with CPU – Input/output – Components and features of CPU – Program Instructions -Control Unit - Arithmetic logic unit – Registers – Significance of data, address and control bus – Architecture of Intel 8085A and Pin Configuration.

UNIT IV MICROPROCESSOR PROGRAMMING 9

Programming concepts – Machine code – Hex code – Basic concepts of assembly language – Instruction sets – Addressing modes – Assembly language programming examples – Addition of 8 bit numbers in two memory addresses – Subtraction, Multiplication – Division -Determination of the biggest number in the list of numbers - Counting – sorting – Delay subroutine – Delay with stepper motors.

UNIT V APPLICATIONS IN MECHANICAL SYSTEMS 9

Introduction-Generation of I/O ports-Programmable peripheral Interface(PPI)- Intel 8255 - Keyboard and Display Controller(8279) ,Traffic light control-washing Machine control –DC Motor-Stepper Motor- D/A Converters- A/D converters–Automotive applications – Antilock braking – Steering – transmission and suspension systems- Illustrative Examples.

TOTAL NO OF PERIODS: 45

References:

1. M.Morris Mono, Digital Design, 3rd Edition, Prentice Hall of India pvt Ltd.,2003/Pearson Education(Singapore) Pvt Ltd.,New Delhi.,2003.
2. Malvino A.P., Digital Electronics, Principle and Applns.-TMH 1989V.K. Mehta, Principle of Electronics, S.Chand & Company, 2007.
3. Goankar R.S., Microprocessor Architecture programming and Applications, New Age International.2006.
4. Kenneth J.Ayala.”The 8086 Microprocessor: Programming & Interfacing the PC”Delmar Publishers, 2007.
5. W.Bolton, Mechatronics, Addison Wesley Longman, 2006.
6. Douglas V., Hall, Microprocessors Interfacing,Programming And Hardware, TMH 2007

BME5L1 THERMAL LAB 0 0 3 2

OBJECTIVES:

- To practical understand the concepts and working of various thermal application like IC engines, Steam Turbines, Compressors and Refrigeration and Air conditioning systems

Course Outcomes:

CO 1: Upon completion of this course, the students can able to understand IC engines , Air compressor.

CO2: Will get knowledge on air conditioning

CO3: Will understand the positioning of engine

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		W	M						M			
CO2		W			W				M			
CO3		W			M				W			
CO4												
CO5												

Practical

Direct	**Indirect**
Observation Book	Student Exit Survey
Record Book	Faculty Survey
Model exam	Industry
Viva Voce	Alumni
End semester exam	

1. Flash and Fire point of liquid fuel
2. Determination of viscosity using Saybolt and Redwood viscometer
3. Flue gas analysis using Orsat apparatus
4. Performance characteristics of a Air blower
5. Valve timing diagram of a four stroke engine, Port timing diagram of a two stroke engine
6. Determination of mechanical efficiency of four stroke diesel engine
7. Determination of mechanical efficiency of two stroke petrol engine
8. Heat balance test on a four stroke diesel engine
9. Heat balance test on a four stroke petrol engine
10. Determination of optimum cooling water rate on a single cylinder diesel engine
11. Performance test on a multi cylinder petrol engine- Morse test
12. Test on Air compressor
13. Performance test on a Refrigeration plant
14. Performance test on A/C plant
15. Performance test of Cooling tower

BME5L2 MANUFACTURING TECHNOLOGY LAB – II 0 0 3 2

OBJECTIVES

- To give practical hands on exposure to students in the various metal cutting operations using commonly used machine tools

Course Outcomes:

CO1: Upon completion of this course, the students can able to understand and compare the functions and applications of different metal cutting tools

CO2: TO demonstrate the programming in CNC machining

CO3: Upon completion of this course, the students can able to apply the different metal removing ,finishing and super finishing and for component production.

CO4:Upon completion of this course, the students can able to understand and compare the functions and applications of different metal cutting tools in gear manufacturing.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			M					W				
CO2	M	W							S			
CO3								M			M	
CO4		M										
CO5			S									

Practical

Direct	**Indirect**
Observation Book	Student Exit Survey
Record Book	Faculty Survey
Model exam	Industry
Viva Voce	Alumni

1. Shaper Exercise : Making a square from a round rod
2. Exercise on dovetail cutting
3. Exercise on Plane milling.
4. Exercise on Spur Gear Milling
5. Exercise on Helical Gear Milling
6. Grinding a single point cutting tool in tool and cutter grinder.
7. Slotting and key way cutting in vertical slotting machine.
8. Determination of cutting forces in Milling and drilling using dynamometers

BME5L3 INSTRUMENTATION AND DYNAMICS LAB 0 0 3 2

OBJECTIVES:

- To supplement the principles learnt in kinematics and Dynamics of Machinery
- To understand how certain measuring devices are used for dynamic testing.

Course outcomes

CO1: Students will gain knowledge in kinematics and Dynamics of Machinery
CO2: Students will understand how certain measuring devices are used for dynamic testing.
CO3: Students will gain knowledge regarding various types of forces and reactions.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		W	S		M							
CO3		M		S								
CO4												
CO5												

Practical

Direct	**Indirect**
Observation Book	Student Exit Survey
Record Book	Faculty Survey
Model exam	Industry
Viva Voce	Alumni
End semester exam	

INSTRUMENTATION LAB

1. Pressure measuring device calibrations
2. Force measurement load cell, providing ring
3. Temperature measuring devices: Thermocouple, Platinum resistance thermometer.
4. Speed measurement: Tachometer & Stroboscope
5. Torque measurement
6. Flow measurement: Orifice meter, Rotometer.
7. Vibration measurement.

DYNAMICS LAB

1. Kinematics of four bar mechanism – Slider crank chain, Quick return mechanism.
2. Kinematics of gear trains – Simple, Compound, Epicyclic
3. Determination of M.O.I by using connecting rod and flywheel
4. Governors – Watt, Porter
5. Study of cam profile
6. Motorized gyroscope and verification of losses
7. To determine the stiffness and natural frequency of spring-mass-system- single
8. D.O.F and verification of spring laws.
9. Determination of M.O.I using compound pendulum.
10. Determination of stiffness and natural frequency of single rotor and two rotor shafts.
11. Determination of critical speed of shaft with concentrated loads- Whirling of shafts.
12. Balancing of rotors.

BME5L4 TECHNICAL SEMINAR – II 0 0 2 1

Objective: To make them master the techniques of professional communication so that they become employable after completing the course.

Course outcomes:

CO1: After the completion of the course the students can communicate without any inferior complex
CO2: They can answer the questions asked in the campus interview without any difficulty
CO3: They very well can manage the abroad job situations.
CO4: They will become effective communicators once the course is completed.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						W						
CO2		W	M		M							
CO3	W			M			W			M		
CO4												
CO5												

Practical

Direct	Indirect
Observation Book	Student Exit Survey
Record Book	Faculty Survey
Model exam	Industry
Viva Voce	Alumni
End semester exam	

During the Seminar session each student is expected to prepare and present a topic on engineering/ technology, for a duration of about 8 to 10 minutes. In a session of three periods per week, 15 students are expected to present the seminar. A faculty guide is to be allotted and he/she will guide and monitor the progress of the student and maintain attendance also.
Students are encouraged to use various teaching aids such as over head projectors, power point presentation and demonstrative models. This will enable them to gain confidence in facing the placement interviews.

Need to Present paper.

BME601 MACHINE DESIGN - II 3 1 0 4

OBJECTIVES:

- To gain knowledge on the principles and procedure for the design of power Transmission components.
- To understand the standard procedure available for Design of Transmission sip terms

Course Outcomes:

CO1 : Upon completion of this course, the students can able to successfully design transmission components used in Engine and machines.

CO2: Will understand optimum design procedure

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			M					M				
CO2		W								M		
CO3												
CO4												

CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	

UNIT I BEARINGS 12

Design of sliding contact bearings using Sommerfeld number - Selection of rolling contact bearings for radial and axial load combination and for varying load cycles.

UNIT II BELTS AND CHAINS 12

Design of flat belts and V – belts using manufacturer's data – Design of chain drives using manufacturer's data –PSG.

UNIT III SPUR AND HELICAL GEARS 12

Design of spur and helical gears – Russian Design Procedure (PSG Design Data Book / Design of Transmission Elements – T.J. Prabhu)

UNIT IV BEVEL, WORM GEARS, POWER SCREW 12

Design of bevel and worm gears – Design of Power screws for machine tool application. Russian Design Procedure (PSG Design Data Book / Design of Transmission Elements – T.J. Prabhu)

UNIT V MULTI SPEED GEAR BOXES 12

Design of speed reducers. (Not for Examination)

Design of Multispeed Gear boxes for machine tools - Ray Diagrams, Kinematic diagram and Number of teeth calculation for gears.

TOTAL NO. OF PERIODS : 60

Text books :

1. Prabhu T.J. Design of Transmission Elements, 2008.

References :

1. Shigley, Mechanical Engineering Design – Tata McGrawHill, 2004.
2. Dobrovolosky, Machine Elements – Mir Publications, 1978.

3. Pandya & Shah – Elements of Machine Design, 2000.
4. Maitra, Handbook of Gear Design – Tata McGraw Hill,1995.
5. Design Data, PSG College of Technology, 2003.

BME602 FINITE ELEMENT ANALYSIS 3 1 0 4

OBJECTIVES:

- To introduce the concepts of Mathematical Modeling of Engineering Problems.
- To appreciate the use of FEM to a range of Engineering Problems.

Course Outcomes:

CO1: Upon completion of this course, the students can able to understand different mathematical Techniques used in FEM analysis and

CO2: Understand use of FEA in Structural and thermal problem

CO3: Understant the application of FEA in heat transfer problem

CO4: Understand computerized FEA

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S		M					S				
CO2	S								M			
CO3	S	W	M									
CO4	S	W		M								
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	

UNIT I **12**

Field problems – Elementary treatments – Elements and types – Steady state problems – Propagation problems – Eigen value problems – Differential formulation – Weighted residual

Method- Galarkin Approach – Variational methods – Convergence criteria.

UNIT II **12**

Bar element – Mechanical and Thermal loads – Shape functions – Lagrange's Interpolation – Temperature effects and strain distributions.

UNIT III **12**

Heat Transfer-Conduction, Convection, Radiation, Elasticity concepts – Plane stress and Plane strain - Euler - Bernoulli Beam Elements – Trusses and Frames.

UNIT IV **12**

Node numbering – Natural co-ordinates – Isoparametric formulation – Gauss quadrature – Choice of quadrature rule – Gauss Point.

UNIT V **12**

Computerized FEA – Preprocessing –Element types - Mesh generation – Solution – Post processing – Procedures of Case studies.

TOTAL NO. OF PERIODS : 60

Text Books:

1. J.N.Reddy – An introduction to Finite Element Method – McGraw Hill, 2007.
2. S.Senthil- An introduction to Finite Element Analysis – Laxmi Publications.

References :

1. K.J.Bathe – Finite Element Procedure – Prentice Hall of India, 1996.
2. O.C.Zienkiewicz–The Finite Element Method in Engineering Science, McGrawHill, 2000.
3. T.R.Chandraputla , A.D.Belegundu – Introduction to Finite Elements in Engineering – Prentice Hall of India, 2002.
4. S.S.Bhavikati – Finite Element Analysis, New Age International Publishers, 2005.

BME603 HEAT AND MASS TRANSFER 3 1 0 4

OBJECTIVES:

- To understand the mechanisms of heat transfer under steady and transient conditions.
- To understand the concepts of heat transfer through extended surfaces.
- To learn the thermal analysis and sizing of heat exchangers and to understand the basic concepts of mass transfer. (Use of standard HMT data book permitted)

Course Outcomes:

CO 1: Upon completion of this course, the students can able to understand different heat and mass transfer principles..

CO2: Apply different heat and mass transfer principles of different applications.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	PO11	PO12
CO1		W		M					W			
CO2			W									
CO3												
CO4												
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	

UNIT I STEADY STATE HEAT CONDUCTION 12

Fourier law of conduction, general equation in Cartesian, cylindrical and spherical co-ordinates, One dimensional steady state conduction across plane wall-Composite wall-composite cylinder-composite sphere with convection boundaries, Overall heat transfer co-efficients, critical thickness of insulation, conduction with generation, conduction and convection systems-fins with direct boundary conditions(Derivations not included)

UNIT II UNSTEADY STATE HEAT CONDUCTION 12

Unsteady state conduction-Lumped capacity systems, semi-infinite solids, infinite solids and multi dimensional systems, Numerical solution of 2-dimensional steady and unsteady condition

UNIT III CONVECTION 12

Principles and governing equations, Natural convection from vertical, inclined and horizontal surface, Forced convection-Heat transfer from a flat plate, flow through pipes, condensation and boiling processes-Heat exchangers-Type of heat exchangers-Overall heat transfer co-efficient, LMTD & NTU methods, Fouling factor

UNIT IV RADIATION 12

Black body concept, Grey body, Radiation shape factor, relation between shape factors, radiation heat transfer between two surfaces, Radiation shields, Gas radition,Solar radiation

UNIT V MASS TRANSFER 12

Fick's law of diffusion, Stefan's law, Mass transfer co-efficient, Non-dimensional number used in mass transfer, evaporation process in the atmosphere.

TOTAL NO. OF PERIODS: 60

Text Book:

1. Sachdeva.R.C-Fundamentals of Heat&Mass Transfer-NewAgeInternational(P)Ltd, 2003

References:

1. OzisikN.M-heat transfer-McGraw hill Book Company, 1985
2. Holman.J.P-heat transfer –McGraw hill Book Company, 2002
3. Dr.D.S.Kumar,Heat and mass transfer,S.K.Kataria& sons,2003
4. P.K.Nag, Heat transfer, McGraw hill Book Company,2002

BME604 CAD/CAM 3 0 0 3

OBJECTIVES:

- This course will enable the student To gain knowledge about the basic fundamental of CAD.
- To gain knowledge on how computers are integrated at various levels of planning and manufacturing understand computer aided planning and control and computer monitoring.

Course Outcomes:

CO1: Upon completion of this course, the student can able to understand the use of computers in process planning

CO 2 :Understand the benefits of FMS and Robotics in CIM

CO 3 : knowledge of CNC.

CO4 : Understand the computer aided design of machine elements

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

CO1	S					M			W			
CO2	S			W				M				
CO3	S											
CO4	S										M	
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	

UNIT I INTRODUCTION TO CAD AND ITS ELEMENTS 9

Principles of Computer hardware, Software and Operating System, application Programs, Data Handling and File Structures, Computer aid in Phases of design- Development of Design Database using CAD Systems- Conceptual Design Process Analysis Optimization- Detailed Design and Documentation.

UNIT II ELEMENTS OF CAD SYSTEMS AND DESIGN USING COMPUTERS 9

Elements of CAD Systems, Introduction to Graphic Hardware, Software, Details of 2D Software Packages-Layering, Drawing Primitives, Display Techniques, Editing, utilities, Scaling, Dimensioning, 3D Visualization,Geometric Modeling-Wireframe and Solid models.

UNIT III DESIGN USING COMPUTERS 9

Design of Gears, Couplings, Flywheels, Shafts Connecting Rods etc. Software for Vibration Problems- Stress Analysis, Kinematic Analysis, Dynamic Analysis.

UNIT III COMPUTER AIDED MANUFACTURING 9

Numerical Control- Modes- NC Elements- NC Machine Tools- CNC Machines- CNC Hardware Basics- CNC Tooling- CNC Machine Tools and Control System- Part Programming- Manual and Computer Aided- Turning Center Programming- Advanced Part Programming- Direct Numerical Control- Adaptive Control- Computer Aided Part Programming, APT. Introduction to Robotics, Group Technology, Computer Aided Process Planning, FMS.

UNIT V COMPUTER INTEGRATED MANUFACTURING 9

CIM as a Concept and a Technology- CASA/SME Model of CIM-Benefits- Communication Matrix in CIM- Fundamentals of Computer Communication n CIM, CIM Data Transmission Method, Serial , parallel, asynchronous, modulation, Demodulation, Simplex and Duplex- Types

of Communications in CIM- Point to Point, Star and Multiplexing- CIM for Batch Production- Group Technology – FMS- Process Control in CIM- Characteristics of Manufacturing Process Data- Continuous, Analog, Discrete Binary and Pulse Data- ADC/DC Multiplexers, Process Monitoring Through Computer- Types of Computer Process Control- Preplanned, Direct Digital Control (DDC)- Regular Control and Feed Forward Control, Requirements of Control Programming Interrupt, Real Time Clock Input.

TOTAL NO. OF PERIODS: 45

Text Book:

1. Radhakrishnan P. CAD/CAM/CIM, I Edition, New central Book Agency, 2006.

References:

1. Rao P.N. CAD/CAM, Principles and Application, Tata McGraw Hill, 2005.
2. Mikell P.Groover, Automation, Production Systems and CIM, II Edition, Prentice Hall of India,2001.
3. Chris McMahon and Jimmy Browne, CAD/CAM, Pearson Education, 2001.

BME605 INDUSTRIAL ROBOTICS 3 0 0 3

OBJECTIVES:

- To understand the basic concepts associated with the design and Functioning and applications of Robots To study about the drives and sensors used in Robots
- To learn about analyzing robot kinematics and robot programming

Course Outcomes:

CO1: Upon completion of this course, the students can able to apply the basic engineering knowledge for the design of robotics.

CO2: Will understand robot kinematics and robot programming.

CO3: Will understand application of Robots

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	W			M			W	M			
CO2	S		W					W	M			
CO3	S	M	M									
CO4												

CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	

UNIT I INTRODUCTION TO ROBOTICS 9

Definition of Robot – Laws of Robotics – Basic concepts – Robot Configuration – Types of Robot drives – Basic Robot motions – Point to Point control – Continuous path control – Accuracy and repeatability.

UNIT II COMPONENTS OF ROBOTICS 9

Control system components-Control system analysis–Actuation and feed back– manipulators – Direct kinematic model and inverse kinematic model – Coordinate transformation – Robot dynamic modeling – Types of Robot and end effectors - Tools as end effectors

UNIT III SENSING AND MACHINE VISION 9

Range sensing – Proximity sensing – touch sensing – force and torque sensing.
Introduction to machine vision – Sensing and digitalizing – Image processing and analysis.

UNIT IV ROBOT PROGRAMMING 9

Methods online/ offline – Show and teach – Teach pendant – lead and teach – Languages Explicit – task level – capabilities and limitation – Artificial intelligence – Knowledge representation – Search techniques.

UNIT V ROBOT APPLICATIONS 9

Applications of robots in machining – Welding – Assembly – Material handling – processing – Loading and un loading – CIM inspection – Hostile and remote environments – Non industrial applications.

Total No. of Periods: 45

References:

1. Michael P.Groover, Mitchell Weiss, Industrial Robotics Technology Programming and applications, - McGraw Hill International Editions, 1989.
2. K.S.Fu., R.C. Gonalez , C.S.G. Lee, Robotics, Control sensing, Vision and Intelligence, - McGraw Hill International Editions, 1987.

3. Michael – B.Histland, David. G. Aliatoce., Introduction to Mechatronics and Measurement Systems, McGraw Hill International. Edition, 1999.

BME6L1 HEAT TRANSFER LAB 0 0 3 2

OBJECTIVES:

- To understand the mechanisms of heat transfer under steady and transient conditions.
- To understand the concepts of heat transfer through extended surfaces.
- To learn the thermal analysis and sizing of heat exchangers and to understand the basic concepts of mass transfer.

Course Outcomes:

CO 1: The students can able to understand different heat transfer equipments
CO2: Apply different heat and mass transfer principles of different applications.
CO3 : Will practicaly know about wind tunnel

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	PO11	PO12
CO1		W		M					W			
CO2			W				W					
CO3		W								M		
CO4												
CO5												

Practical

Direct	**Indirect**
Observation Book	Student Exit Survey
Record Book	Faculty Survey
Model exam	Industry

Viva Voce	Alumni
End semester exam	

1. Thermal conductivity of insulating materials
2. Thermal conductivity of guarded hot plate method
3. Heat transfer through composite wall
4. Heat transfer by free and forced convection
5. Test on heat exchangers- parallel and counter flow
6. Emissivity measurement apparatus
7. Heat transfer from fins-natural and forced convection
8. Stefan-Boltzman apparatus
9. Test on Pinfin apparatus
10. Study on Wind tunnel- Drag and lift measurement

BME6L2 CAD/CAM 0 0 3 2

OBJECTIVES:

- This course will enable the student To gain knowledge about the basic fundamental of CAD and CAM

Course Outcomes:

CO1: Upon completion of this course, the student can able to understand the use of computers in design

CO 2 :Understand the benefits of computer aided design

CO 3 : knowledge of CNC.

CO4 : Understand the computer aided manufacturing of machine elements.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S				M			W			
CO2		S		W				M				
CO3		S										
CO4		S									M	
CO5												

Practical

Direct	Indirect
Observation Book	Student Exit Survey
Record Book	Faculty Survey
Model exam	Industry
Viva Voce	Alumni
End semester exam	

CAD Introduction to Computer Aided Drawing

2-D DRAWING Orthographic Views, Isometric Views, 2D Sectional Views, Part Drawing, Assembly Drawing, Detailed Drawing. Dimensioning, Annotations, Symbols, Welding, Surface finish, Threads, Text, Bill of Materials. Exercise- Knuckle Joint, Gib and Jotter Joint, Screw Jack, Foot Step Bearing.

3-D DRAWING Part Modeling- Protrusion, Cut, Sweep, Draft and Loft- Modify/Edit-Pattern-Transformation, Boolean operation. Assembly- Creating Assembly from Parts, Modify/Edit-Pattern Conversion of 3D Solid Model to 2D Model. Surface Modeling- Tabulated, Revolve, Ruled and Edge Surfaces. Exercise- Piston, Connecting Rod, Knuckle Joint, Universal Joint, Couplings.

CAM LAB

1. Manual Part programming for CNC machines Using standard G – Codes and M- codes. Simulation of Tool path – Machining Practices on Trainer type CNC Machines – Straight cut, Taper turning, Profile, Parting, Thread cutting.
2. CNC Milling Machine: Production of Various Contour shapes
3. Computer assisted part programming – APT programming Language – Part programming using APT and other NC programming Languages.
4. Introduction to Component Modeling
5. NC code generation using CAD / CAM software – Post processing for standard CNC controls like FAUNC, SINUMERIC etc.,

BME6L3 DESIGN AND FABRICATION PROJECT 0 0 6 3

OBJECTIVES:

The objective of this project is to provide opportunity for the students to implement their skills acquired in the previous semesters to practical problems.

Course Outcomes:

CO1:, the student can able to design the components they required

CO 2 :Understand the different fabrication processes.

CO 3 : will gain confidence to face industrial environment.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						M			S			
CO2				W				M	S	M		
CO3								M				
CO4												
CO5												

Practical

Direct	**Indirect**
Observation Book	Student Exit Survey
Record Book	Faculty Survey
Model exam	Industry
Viva Voce	Alumni
End semester exam	

The objective of this project is to provide opportunity for the students to implement their skills acquired in the previous semesters to practical problems.

The students in convenient groups of not more than 4 members have to take one small item for design and fabrication. Every project work shall have a guide who is the member of the faculty of the institution.

The item chosen may be small machine elements (Example- screw jack, coupling, machine vice, cam and follower, governor etc) attachment to machine tools, tooling (jigs, fixtures etc), small gear box, automotive appliances, agricultural implements, simple heat exchangers, small pumps, hydraulic/pneumatic devices etc.

The students are required to design and fabricate the chosen item in the college and demonstrate its working apart from submitting the project report. The report should contain assembly drawing, parts drawings, process charts related to fabrication.

BME6L4 TECHNICAL SEMINAR – III 0 0 2 1

Objective: To make them master the techniques of professional communication so that they become employable after completing the course.

Course outcomes:

CO1: After the completion of the course the students can communicate without any inferior complex
CO2: They can answer the questions asked in the campus interview without any difficulty
CO3: They very well can manage the abroad job situations.
CO4: They will become effective communicators once the course is completed.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						W						
CO2		W	M		M							
CO3	W			M			W			M		
CO4												
CO5												

Practical

Direct	**Indirect**
Observation Book	Student Exit Survey
Record Book	Faculty Survey
Model exam	Industry
Viva Voce	Alumni
End semester exam	

During the Seminar session each student is expected to prepare and present a topic on engineering/ technology, for a duration of about 8 to 10 minutes. In a session of three periods per week, 15 students are expected to present the seminar. A faculty guide is to be allotted and he/she will guide and monitor the progress of the student and maintain attendance also.
Students are encouraged to use various teaching aids such as over head projectors, power point presentation and demonstrative models. This will enable them to gain confidence in facing the placement interviews.

Need to Present paper.

BME701 INDUSTRIAL ENGINEERING 3 0 0 3

Course Outcomes:

CO1: Market research, demand forecasting and costing.
CO2: Demonstrate the knowledge of designing plants and controlling Production.
CO3: Optimize the resources of an organization and improve productivity.
CO4: A systematic understanding of design, improvement and installation of integrated systems of people, materials, money, equipment and energy.
CO5:Maintain high standards of professional and ethical responsibility

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	PO11	PO12
CO1		W	M					W				
CO2			W						M			
CO3			M		W							
CO4		W	M								M	
CO5				S		S						

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni

Online Test	

UNIT I PRODUCTION AND PRODUCTIVITY 9

Definitions-Productivity, Effectiveness, and Types-Factors Influencing Productivity-Techniques To Improve Productivity, Technology Based Techniques and material Based Productivity Improvement-Inventory Control-M.R.P-Quality Circles-Brainstorming-Pareto Analysis-Cause And Effect Analysis-TQM-Zero Defects-Flextime-Just In Time-Ergonomics-Reliability Improvement-Modular Design-Maintainability**.**

UNIT II PLANT LAYOUT /LOADING AND SCHEDULING 9

Types of Layout, Its Advantages and Disadvantages-Preference of Different Types of Layout, Plant Location and Decision-Definitions: Group Technology-Principles of Material Handling. Loading- Master Scheduling- Perpetual Loading-Order Scheduling-Loading By Scheduled Method-Index Method Of Scheduling-Factors Influencing Scheduling-Production Planning And Control-Routing And Dispatching-Job Card-Job Order-Order Control And Machine Load Chart.

UNIT III WORKSTUDY 9

Techniques of Work Study-Procedure-Method Study, Types of Process Charts and Diagrams-Multiple Activity Chart-Utility-Time Study-Micro Motion Time Study-PMTS-Work Sampling-Job Analysis-Job Evaluation and Merit Rating-Wage and Wage Incentive.

UNIT IV INDUSTRIAL PSYCHOLOGY 9

Introduction-Nature And Scope-Objectives-Hawthorne Studies And Its Conclusion-Individual Behaviour-Group Behaviour,Types Of Groups-Formal And Informal Organizations-Fatigue – Accident,Major Factors,Prevention-Importance And Methods Of Training To The Employees, Methods And Aids-Leadership And Leadership Styles-Communication And Its Importance.

UNIT V STATISTICAL QUALITY CONTROL 9

Introduction to Quality Control-Statistical Measures-Control Chart-Types –Control Chart for Attributes-Control Chart for Number of Defects per Unit-Acceptance Sampling-Basic Probability-Normal Distribution-Acceptable Quality Level-Lot Tolerance Percent Defective-Average Outgoing Quality

TOTAL NO .OF PERIODS: 45

Text Books:

1. Khanna.O.P. Industrial Engineering and Management, Khanna Publishers, New Delhi, 2000.
2. B.Kumar, Industrial Engineering, Hanna Publishers,2004
3. S.Ramachandran And K.Pandian Principles Of Management And Industrial Psychology, Air Walk Publishers, 2007.

References:

1. Gupta And Petal, Work Study- Khanna Publishers, 1998.

BME702 POWER PLANT ENGINEERING 3 0 0 3

OBJECTIVES:

- To understand the various components, operations and applications of different types of power plants .

Course Outcomes:

CO1: Upon completion of this course, the students can able to understand different types of power plant, and its functions and their flow lines and issues related to them.

CO2: Analyse and solve energy and economic related issues in power sectors.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	PO11	PO12
CO1		W	M					S				
CO2		W								M		
CO3											W	
CO4												
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	

UNIT I STEAM POWER PLANT 9

Various components ,types of firing systems-pulverized fuel, tilting and tangential systems, fluidized bed combustion system, coal handling systems-crushers, feeders, ash handling system-Dust collectors ID and FD fans-flue stack, Feed pumps, Economizers, Air preheaters, Super

heaters, Reheaters, Condensers- Types.

UNIT II STEAM GENERATORS AND POWER CYCLES 9

Boilers-types-Boiler efficiencies, combustion calculations, equivalent evaporation, Boiler power, cooling towers-tower characteristics. Review of Rankine cycle-reheat, regeneration with open and closed type of feed water heaters and their representation in T-S diagram

UNIT III NUCLEAR, HYDEL AND GAS TURBINE POWER PLANTS 9

Nuclear energy,Fission,Fusion reaction, chain reaction, parts and types, waste disposal and safety in nuclear plants,Hydel plants-classification, selection of turbines, pumped storage system, performance evaluation of turbines. Gas turbine plants-open and closed cycles-combined cycle plants and their representation in T-S diagram

UNIT IV NON CONVENTIONAL ENERGY BASED POWER PLANTS 9

Wind energy, wind mills, wind forming, site selection and limitation, tidal power plants, solar energy-Various solar power energy systems, geothermal energy, Fuel cells, thermionic and thermo electric converters, magneto hydro dynamic plant.

UNIT V ECONOMICS OF POWER GENERATION 9

Load duration curves, power plant economics, fixed and operating costs, Load sharing and plant selection, Economical comparison of various power plants and co-generation. Environmental consideration of various power plants-CO_2, SO_2, NOx and particulate emissions and their control

TOTAL NO. OF PERIODS: 45

Text Book:

1.P.K.Nag-Power plant Engineering-Tata McGraw Hill publishers, 2008

References:

1. G.R.Nagpal- Power plant Engineering-Khanna publishers, Delhi, 1998
2. G.D.Rai-Non Conventional sources of Energy, 2004.
3. G.D.Rai-Power plant engineering,khanna publishers, 2000

BME 703 OPERATIONS RESEARCH FOR ENGINEERS 3 1 0 4

OBJECTIVES:

To impart knowledge about various tools in Operations Research to apply and solve real life problems in Engineering.

Course Outcomes:

At the end of this course, students are able to

CO1: Formulate a raw problem into LPP or TP or AP and solve them by using relevant method.

CO2: Solve network problems by applying PERT or CPM concept.

CO3: Find optimum stock level in an inventory system with many products.

CO4: Solv**e** queuing problems with single and multiple channels.

CO5: Make decisions for replacement of equipments under stochastic situations.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	PO11	PO12
CO1		M	M		S		W					
CO2		M	W									
CO3		M	W				M					
CO4		M										
CO5		M										

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	

UNIT – I LINEAR PROGRAMMING 12

Introduction to phases of Operations Research – Linear programming – formulation of the problem – graphical method – simplex method – two phase method – Assignment problems – Transportation models – Vogel's approximation method – Modi method – unbalanced transportation problem – degeneracy in transportation models.

UNIT – II RESOURCE SCHEDULING AND NETWORKS 12

Resource scheduling – Sequencing n jobs through 2 machines and 3 machines. Networks – PERT and CPM – Network diagrams – shortest route – minimum spanning tree – probability of achieving completion date – crash time – cost analysis – resource smoothing and resource levelling.

UNIT – III INVENTORY AND REPLACEMENT MODELS 12

Inventory models- Types of Inventory and variables in the Inventory problem – deterministic models- Replacement models – Replacement of items that deteriorate with time – equipment that

fails completely and their analysis – factors for evaluation of proposals of capital expenditures and comparison and alternatives – present value average investment – rate of return pay off period – individual and group replacement policy.

UNIT – IV QUEUEING MODELS 12

Queuing theory – queuing system and structure – Kendalls's notation– Poisson arrival and exponential service time – characteristic of queuing models – single channel and multiple models – simulation.

UNIT –V DECISION MODELS 12

Game theory –Saddle point-Maximin-Minimax principle-Two person zero sum games(mixed Strategies)-Graphical method for 2×n or m×2 games-Dominance Property-Oddment method.

Total No. of Periods : 60

TEXT BOOKS :

1. Kanti Swarup, Gupta, P.K and Manmohan, "Operations Research", Sultan Chand & Sons, New Delhi. 1997

References:

1. Handy A. Taha, "Operations Research", 7th Edn. Prentice Hall of India. 2007.
2. Gupta and Hira DS " Operations Research", S. Chand & Co, New Delhi, 2006
   Paneerselvam.R. "Operations Research", PHI, New Delhi. 2009

BMT7L1 FLUID POWER AUTOMATION LAB & MICROPROCESSOR LAB

0 0 4 2

Objective:

To eneble the student to understand different hydraulic and pneumatic components and their design.

Course Outcomes:

CO1: Upon completion of this course, the student can able to understand the use of Hydraulic and pneumatic components

CO 2 : Able to design logical circuits.

CO 3 : Will get knowledge CMM based instruments.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S				M			W	M		

CO2		M		W				M			M	
CO3		S										
CO4												
CO5												

Practical

Direct	**Indirect**
Observation Book	Student Exit Survey
Record Book	Faculty Survey
Model exam	Industry
Viva Voce	Alumni
End semester exam	

1. Design and testing of the circuits such as i) Pressure, ii) Flow and iii) Direction control valves
2. Design of circuits with logic sequence using electro pneumatic trainer kits
3. Simulation of basic hydraulic, pneumatic and electric circuits using soft ware
4. Circuits with multiple cylinder sequences in electro pneumatic using PLC
5. Servo controller interfacing i) open loop ii) closed loop
6. Stepper motor interfacing with 8051 microcontroller (i) Full step resolution ii) Half step resolution
7. Computer controlled relays, solenoids and DC motors
8. Study of CMM based instrumentation
9. Modeling and analysis of basic electrical, hydraulic and pneumatic systems using LABVIEW software

BME7L1 COMPUTER AIDED ANALYSIS & SIMULATION LAB 0 0 4 2

Objective:

To eneble the student to carry our computer aided analysis of engineering components**.**

Course Outcomes:

CO1: Upon completion of this course, the student can able to understand the use of computers in design and analysis

CO 2 :Understand the benefits of computer aided analysis

CO 3 : Will get knowledge of different finite elements used for meshing.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S				M			W	M		
CO2		S		W				M				
CO3		S										
CO4												
CO5												

Practical

Direct	**Indirect**
Observation Book	Student Exit Survey
Record Book	Faculty Survey
Model exam	Industry
Viva Voce	Alumni
End semester exam	

A. PROGRAMMING IN MATLAB

1. Simple Applications in Arithmetic, Linear Algebra, Matrix operations.
2. Basic 2-D plots like i) Creating the circle ii) Creating the sine curve
3. Simulation of Mechanical Systems

B. MESHING AND ANALYSIS

1. Simple Meshes using a Meshing Software
2. Stress analysis of a plate with circular hole
3. Stress analysis of beams (Cantilever, Simply supported and fixed beams)
4. Thermal analysis of hot fluids in a pipe line
5. Mass flow of flue gases in an exhaust pipe
6. Harmonic analysis of a thin plate under axial loading
7. Mode frequency of a 2D component

BME7L2 COMPREHENSION 0 0 2 1

OBJECTIVES:

- The objective of comprehension is to provide opportunity for the student to apply the knowledge acquired during the earlier semesters to real life problems which he / she may have to face in future as an engineer.

- While learning as how to solve the real life problems, student will receive guidance From the faculty and also review various courses learnt earlier.
- Further this comprehension is to achieve an understanding of the fundamentals of contemporary manufacturing systems including materials, manufacturing process, product and process control, computer integrated manufacture and quality.
- The students work in groups and solve a variety of problems given to them.
- The problems given to the students should be of real like industrial problems selected by a group of faculty members of the concerned department

Course Outcomes:

- **CO1:** able to apply the knowledge attain to real life problems which he / she may have to face in future as an engineer.
- **CO 2** :Understand the fundamentals of contemporary manufacturing systems including materials, manufacturing process, product and process control, computer integrated manufacture and quality.

  CO 3 : will able to solve engineering problems

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						M			W	M		
CO2				W				M				
CO3					M		W					
CO4												
CO5												

-

Practical

Direct	**Indirect**
Observation Book	Student Exit Survey
Record Book	Faculty Survey
Model exam	Industry
Viva Voce	Alumni
End semester exam	

In comprehension, the knowledge acquired by the students in the earlier semesters, is tested. The student is prepared to face competitive examinations. There will be internal tests involving objective type and short answer type questions. There will not be any end semester examination.

BME8L1 **PROJECT WORK** **0 0 12 6**

OBJECTIVES:

- The objective of the project work is to enable the students in convenient groups of not more than 4 members on a project involving theoretical and experimental studies related to the branch of study.
- Every project work shall have a guide who is the member of the faculty of the institution. The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design and manufacture of a device, a research investigation, a computer or management project or a design problem.
- The progress of the project is evaluated based on a minimum of three reviews.
- Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, project work details and conclusion.
- This final report shall be typewritten form as specified in the guidelines.
- The continuous assessment shall be made as prescribed in the regulations.

Course Outcomes:

CO1:, The student can able to design the components they required

CO 2 :Understand the different fabrication processes.

CO 3 : Will gain confidence to face industrial environment.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						M			S			W
CO2		M		W				M	S	M		
CO3								M				
CO4				S							W	
CO5												

Practical

Direct	**Indirect**
Observation Book	Student Exit Survey
Record Book	Faculty Survey
Model exam	Industry
Viva Voce	Alumni
End semester exam	

ELECTIVES

BME001 DESIGN OF HEAT EXCHANGERS 3 0 0 3

OBJECTIVES

To learn the sizing of heat exchangers, thermal and mechanical stress analysis for various heat exchange applications.

Course Outcomes:

At the end of this course, students shall be able to

CO1:Will understand thermal and hydraulic design.
CO2: Will understand heatexchanger design.
CO3: Will able to do compact heatexchanger design.
CO4: Will understand the concept of cooling tower.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				S						S		
CO2						S						
CO3			W			S			W			
CO4			W							S		
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I DOUBLE PIPE HEAT EXCHANGERS & HEAT PIPES 9

Thermal And Hydraulic design – Inner pipe – Annulus, Hairpin heat exchanger – Basic inner

tube – Finned multi tubes – Parallel and series arrangements – Pressure drop, Constructional features. Heat pipes – Structures – Applications – Basic relations – Performance characteristics – Effect of working fluid and operating temperatures, Wick – Selection of materials – bore size.

UNIT II SHELL AND TUBE HEAT EXCHANGERS 9

Basic components – shell – tube bundles – baffles – type and geometry, design procedure – preliminary estimation of size, pressure drop and Heat transfer calculations – shell and tube sides – Kenn method – Bell – Delaware methods.

UNIT III COMPACT HEAT EXCHANGERS & GASKETTED PLATE HEAT EXCHANGERS 9

Compact Heat Exchangers – types – constructional features, heat transfer and pressure drop calculations – Finned plate and tube.

Gasketted plate Heat Exchangers - constructional features plate, pack and flame – Operational characteristics – Flow arrangements, Heat transfer and pressure drop calculations, Performance analysis, Comparison with other types of heat exchangers.

UNIT IV CONDENSERS & EVAPORATORS 9

Shell and tube condensers – Horizontal and vertical types – Design and operational consideration, Plate condensers, Air cooled and direct contact type condenser for refrigeration, Evaporative condensers.

Evaporators for refrigeration and air conditioning – Chillers – air coolers – thermal analysis – Shah, Kandhkar and Ghnkor and Winterom Correlations, Standard types.

UNIT V COOLING TOWERS 9

Cooling towers - Types – Basic relation – Heat balance and heat transfer characteristics and effect of packing – Geometry, Spray design, Selection of pumps, fans, testing, Maintenance, environmental effects, wind load, typical installations.

TOTAL NO. OF PERIODS: 45

References:

1. Sadik Kakal & Homgton Lin – Heat Exchangers – CRC Press, London, 1998.
2. Arthur.P.Fraas, - Heat exchanger Design, John Willey & Sons, 1997.
3. Kenn.D, - Process heat transfer – Tata McGraw Hill, 1980.

Holger Martin - Heat exchangers – Hemi sphere Publishing Corporation, London

BME002 CRYOGENIC ENGINEERING 3 0 0 3

OBJECTIVES

The purpose of this course is to give introductory knowledge of cryogenic Engineering

Course Outcomes:

At the end of this course, students shall be able to

CO1: Will have detailed knowledge of cryocoolers, on which research is going on worldwide.

CO2:Will have both theoretical and mathematical knowledge in cryogenic engineering.

CO3:Will give a research career in Cryogenic Engineering

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		W					S			M		
CO2				W						M		
CO3				M		W	M			M		
CO4												
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I INTRODUCTION 10

Cryogenic engineering -Properties of cryogenic fluids-Oxygen, Nitrogen, Argon, Neon, Fluorine, Helium, Hydrogen, Properties of solids – Mechanical, Thermal and Electrical – Superconductivity.

UNIT II CRYOGENIC REFRIGERATION 9

Principle – Joule –Thomson expansion, Cascade processes, Ortho, Para hydrogen conversion, Cold gas refrigerators, Linde hampson cycle, Claude & cascade system, Magnetic cooling, Stirling cycle cryocoolers.

UNIT III CRYOGENIC EQUIPMENTS 8

Cryogenics – Heat exchangers, Compressors, Expanders, Effect of various parameters in performance and system optimization.

Insulation and storage equipment for cryogenic fluids, Industrial storage and transfer of cryogenic fluids.

UNIT IV GAS SEPERATION & PURIFICATION 9

Idle gas, mixtures characteristics –Composition diagrams, Gas separation- Principle of rectification, Flash calculation, Rectification column analysis – Air separation, Gas purification.

UNIT V CRYOGENIC INSTRUMENTATION 9

Properties and characteristic of instrumentation, Strain, Displacement, Pressure, Flow, Liquid level, Density and Temperature measurement.

TOTAL. NO. OF PERIODS: 45

Reference Books:

1. Randal. F.Barron, Cryogenic Systems McGraw Hill, 1985.
2. Scott, Cryogenic Engineering – Van Nostrand Co., Inc 1985.
3. Flynnt. M. Cryogenic Engineering- Maxwell, Dekker. 1997.

BME003 NEW AND RENEWABLE SOURCES OF ENERGY 3 0 0 3

OBJECTIVE:

- At the end of the course, the students are expected to identify the new methodologies / technologies for effective utilization of renewable energy sources.

Course Outcomes:

At the end of this course, students shall be able to

CO1: the students can able to identify the new methodologies / technologies for effective utilization of renewable energy sources.

CO2: Get aware about different source of renewable energy.

CO3: Enhance knowledge on solor and wind energy.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium,

W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M						M	M			
CO2				S					M			
CO3					M				W			
CO4												
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I WIND ENERGY 9

Introduction-Location of Wind Generators-Types of Windmills-Induction and Synchronous Systems

UNIT II SOLAR ENERGY 9

Principle of Conversion of Solar Radiation into Heat, Types of Solar Thermal Collectors- Flat Plate And Concentrating Collectors(Parabolic, Trough, Minor Strip, Fresnel Lens and Compound Parabolic Concentrator), Comparison of Collectors, Selective Absorber Coatings, Solar Thermal Power Plant

UNIT III SOLAR ENERGY STORAGE AND APPLICATION 9

Solar energy storage systems- thermal, electrical, chemical, mechanical and electromagnetic, solar pond. Application of solar energy- solar thermoelectric conversion- solar photo voltaics, solar heating and cooling of buildings, solar distillation, solar pumping and solar cookers. System of solar cell power plant- direct grid connection through electronic control devices

UNIT IV BIO- MASS 9

Sources Of Bio-Mass Energy- Wood And Agricultural Waste- Municipal Waste- Animal Waste- Energy Conservation Systems- Biogas Generation From Animal Waste- Wood Gasification- Downdraft And Fluidized Bed Systems- Alcohol Fuels

UNIT V OTHERSOURCES 9

Wave Energy- Scope and Simple Systems for Power Generation, Tidal Power- Scope and Applications, Otec-Scope, Fundamental Principles and Operating System for Power Generation

TOTAL NO OF PERIODS-45

References:

1. David M.Eggleston and Forrest S.Stoddard,Wind Turbine Engineering Designing- Van Noustrand 1987
2. Rai,G.D. Non – Conventional Sources of Energy, Khanna publications, 4th edition 2004
3. Le Gouries.D, Wind Power Plants, Theory and Design –permagon press,1982.
4. F.S.seiler, Alternate Energy Vehicle Information, Wind Book Inc.,1977
5. Barbara Keiler, Energy Alternatives,Luscentr Books,1990
6. T.Nejat Veziroygal, Alternative Energy Sources-III,Hemisphre Publishing co.,1989.

BME004 ENERGY ENGINEERING AND MANAGEMENT 3 0 0 3

OBJECTIVES

To enlight the student in the field of energy engineering concern with energy efficiency, energy service and facitity management

Course Outcomes:

At the end of this course, students shall be able to

CO1: Understand different energy resources and their uses.

CO2: Understand different energy conservation techniques.

CO3: Understand the impact energy on environment

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M		W					S			
CO2						W				W		
CO3							M			M		
CO4												

CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I INTRODUCTION TO ENERGY AND ENVIRONMENT 9

Definition – Fossil fuel reserves – Energy consumption – Green house effect, global warming – Renewable energy resources – Environmental aspects, utilization – energy prizes – Energy policies.

UNIT II ENERGY CONSERVATION 9

Need – different types of energy conservation schemes – industrial energy use – energy surveying and auditing – energy index – cost of energy – cost index-energy conservation in engineering and process industry in thermal systems, in buildings and non conventional energy resources schemes.

UNIT III ENERGY GENERATION BY TECHNOLOGY 9

Fuels and consumption – Boilers – Furnaces – Waste heat recovery systems – Heat pumps and refrigerators – Storage systems – Insulated pipe work systems – heat exchangers.

UNIT IV ENERGY MANAGEMENT 9

Energy management principles – energy resource management – energy management information systems – Instrumentation and measurement – Computerized energy management.

UNIT ENGINEERING ECONOMICS 9

Costing techniques – Optimization cost – Optimal target investment schedules – Finance appraisal – Profitability – Project management.

TOTAL NO. OF PERIODS : 45

References:

1. W.R. Murphy and G. Mckay, Energy Management, Butterworths, London, 1982.
2. Callaghan P.W. Design and Management for Energy Conservation, Pergamon Press,

Oxford,1993.

BME005 NUCLEAR ENGINEERING 3 0 0 3

OBJECTIVES

- To gain some fundamental knowledge about nuclear physics, nuclear reactor, nuclear fuels, reactors and safe disposal of nuclear wastes.

Course Outcomes:

At the end of this course, students shall be able to

CO1: Will gain some fundamental knowledge about nuclear physics.

CO2: Will aquir knowledge about nuclear reactor.

CO3: Will understand about nuclear fuels and will become capable of handeling nuclear waste.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		W			W			M				W
CO2							M		S			
CO3							M			W		W
CO4												
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I ATOMIC STRUCTURE AND NUCLEAR REACTORS & NEUTRONS AND INTERACTION 8

Atomic structure, Nuclear Equation- Energy from nuclear reactions –fusion and fission, nuclear technology, conversion and breeding –Radio activity, effect of radiation. Thermal neutrons, buckling factor, nuclear cross-section, Neutron flux, Volumetric Thermal Source strength-Fission, cross-section in reactors.

UNIT II NEURTON FLUX DISTRIBUTION 10

Neutron life cycle, neutron conservation equation, diffusion equations, reflectors and their effect, Reactivity and reactivity period-Multiplication factor. Void and Void factor, Flow and non-flow system, simple problems-Boiling and non boiling heights, Friction drop in a two-phase channel

UNIT III REACTOR HEAT GENERATION 8

Heat conduction in reactor elements, heat flow of solid planes. Types of fuel elements. Heat flow out of spherical fuel elements, Effect of cladding and coolant absorption of core radiation, Heat removal in slab subjected to radiation, problems, Thermal shields, secondary Radiation

UNIT IV CORE THERMAL DESIGN 10

General consideration ,Arial Temperature ,Distribution of fuel element and coolant, Maximum temperature in fuel elements, Problems, coolant channel orificing, hotspot factors, Core thermal design ,selection of fuel materials, cladding, coolant, moderator, control rods- structural parts-safety considerations and site solution –Disposal of Radio active waste

UNIT V 9

Boiling water reactor- B.W.R modified rankain cycle, Heavy water reactors, as cooled Reactor, liquid metal cooled reactor, Compatibility of liquid metal coolant. Site layout, Shielding and containment decontamination, Hazard evaluation and likening.

TOTAL NO OF PERIODS: 45

Text Books:

1. M.M.E.I Wakil, Nuclear Power Engineering, International Textbook Company.

References:

1. R.L.Murray, Introduction to Nuclear Engineering, Prentice hall.
2. M.M.E.I Wakil, Nuclear Power Engineering ,International Textbook company
3. Gasstone, Nuclear Reactor Engineering ,CBS 1998
4. M.M.E.I Wakil, Nuclear energy conservation, International Textbook Company.

BME006 MEMS AND NANOTECHNOLOGY 3 0 0 3

OBJECTIVES

- To inspire the students to expect to the trends in development and synthesizing of nano systems and measuring systems to nano scale.
- To expose the students to the evolution of Nano systems, to the various fabrication techniques.
- Also to impart knowledge to the students about nano materials and various nano measurements techniques.

Course Outcomes:

At the end of this course, students shall be able to

CO1: The students are expected to understand the general issues relating to nanotechnology and nanofabrication.
CO2: Methods for production of Nanoparticles.
CO3: Characteristic techniques of nanomaterials.
CO4: To expose the students to the evolution of Nano systems, to the various fabrication techniques.
CO5: Also to impart knowledge to the students about nano materials and various nano measurements techniques.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			W						S			W
CO2										M		M
CO3					M			S				
CO4					M					S		
CO5			S									

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

MICRO ELECTRO MECHANICAL SYSTEMS (MEMS)

UNIT – I **9**

Introduction: Historical background development of microelectronics, evolution of micro sensors, MEMS, emergence of micro machines.

Micro sensors: Introduction, thermal sensors, mechanical sensors, flow sensors and Introduction to SAW DEVICES

UNIT – II **9**

MEMS materials and processing: Overview, metals, semiconductors, ceramic, polymeric and composite materials.

Microstereolithography: Introduction, Scanning Method, Projection Method, Applications. LIGA Process: Introduction, Basic Process and Application.

UNIT – III **9**

Micro System Fabrication Processes: Photolithography, Chemical Vapor Deposition, Etching, Bulk and Surface Micro Manufacturing.

NANO-TECHNOLOGY

UNIT – IV **9**

Introduction to Nanotechnology: The nanoscale. Consequences of the nanoscale for technology and society. - Technologies for the Nanoscale, Top-down versus bottom-up assembly. Visualisation, manipulation and characterisation at the nanoscale, Proximal probe technologies. Self-assembly.

UNIT – V **9**

Nanoscale Manufacturing: Nanomanipulation, Nanolithography - An introduction to tribology and its industrial applications - Nanoscale Materials and Structure, Nanocomposites, Safety issues with nanoscale powders - Applications, Applications in energy, informatics, medicine, etc

TOTAL NO OF PERIODS: 45

Text Books:

1. Mark Ratner & Daniel Ratner , Nano Technology, Pearson Education,2003.
2. Tai – Ran Hsu, " MEMS & MICROSYSTEMS Design and Manufacturing", TATA McGRAW- HILL, 2002
3. S.M. Sze, Semiconductor Sensors, John Wiley & Sons, INC., 1994.

References:

1. Marc J. Madou, "Fundamentals of Microfabrication", II Edition, CRC Press, 2002.
2. Mohamed Gad-el-Hak, The MEMS Handbook, CRC Press, 2002
3. M.Elwenspoek, R.Wiegerink, Mechanical Microsensors, Springer-Verlag Berlin Heidelberg, 2001.
4. David Ferry, Transport in Nanostructures, Cambridge University Press, 2000.
5. S. Datta, Electron Transport in Mesoscopic Systems, Cambridge University Press, 1995.
6. Beenaker and Van Houten, Quantum Transport in Semiconductor Nanostructures, in Solid State Physics v. 44, eds. Ehernreich and Turnbull, Academic Press, 1991.
7. P. Rai-Choudhury, Handbook of Microlithography, Micromachining & Microfabrication, SPIE, 1997.

BME007 ADVANCED INTERNAL COMBUSTION ENGINES 3 0 0 3

OBJECTIVES

uupdate the knowledge in engine exhaust emission control and alternate fuels and enable the students to understand the recent developments in IC Engines.

Course Outcomes:

CO1: Will update the knowledge in in engine exhaust emission control. and

CO2: Will understand the concept of alternate fuels .

CO3: Will understand the recent developments in IC Engines.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				M							M	
CO2		W				S						M
CO3				M				W		W		
CO4												
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I SPARK IGNITION ENGINES 9

Spark ignition engine mixture requirements - Feedback control carburetors - Fuel-Injection systems - Monopoint and Multipoint injection - Stages of combustion - Normal and Abnormal combustion - Factors affecting knock - Combustion chambers -Introduction to Thermodynamic

Analysis of S.I.Engine combustion.

UNIT II COMPRESSION IGNITION ENGINES 9

Direct and Indirect systems - combustion chamber - Fuel spray behaviour - Spray structure, Spray Penetration and Evaporation - air motion - Turbocharging - Introduction to Thermodynamic analysis of C.I.Engine combustion.

UNIT III POLLUTANT FORMATION CONTROL 9

Pollutants - Sources and types - Formation of Nox, Hydrocarbon Emission Mechanism - Carbon monoxide formation - Particulate emissions - Methods of Controlling Emissions - Catalytic converters and particulate Traps - Methods of Measurement and driving cycles.

UNIT IV ALTERNATE FUELS 9

Alcohol, Hydrogen, Natural gas and Liquefied petroleum gas - Properties, Suitability, Engine Modifications, Merits and Demerits on fuels.

UNIT V RECENT TRENDS 9

Lean Burn Engines - Stratified charge Engines - Gasoline Direct Injection Engine - homogeneous charge compression ignition - Plasma ignition - Measurement techniques.

TOTAL NO. OF PERIODS: 45

Text Books:

1. R.B.Mathur and R.P.Sharma- Internal Combustion Engines, Dhanpat Rai & Sons, 1994.
2. V. Ganesan-Internal Combustion Engines - Tata McGraw Hill, 2003.
3. K.K.Ramalingam-Internal Combustion engines, Scitech Publications India(P) Ltd. 2000.

References:

1. John B. Heywood, Internal Combustion Engine Fundamentals, McGraw Hill International Editions, 1998.

BME008 SPECIAL CASTING PROCESSES 3 0 0 3

OBJECTIVES

To instill in the student the understanding of the casting industry, processes and a chance to try their hand at it.

Course Outcomes:

The student should show their ability to:

CO1: understand and perform basic casting processes .

CO2. effectively use casting industry tools (real and virtual).

CO3:use technical methodology in analyzing a casting design in terms of casting parameters and cost estimates.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S		M				W		S		S
CO2				M								
CO3				M			S			M		
CO4			S									
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I INTRODUCTION 7

Sand casting-Conventional mould-Core making-Need for special casting process-Applications

UNIT II SHELL MOULDING 8

Process-Machines-Pattern-Sand , resin and other materials – Process parameters – Characteristics of shell mould casting-'D' Process – Applications

UNIT III INVESTEMENT CASTING 9

Process- Pattern and mold materials – Black mold and ceramic shell mold - Mere Cast and Shaw process – Applications.

UNIT IV CETRIFUGAL AND DIE CASTING 9

Types of centrifugal process – calculation of rotating speed of mold – Equipment – Applications.

UNIT V CONTINUOUS CASTING, CO_2 MOULD PROCESS AND FULL MOULD PROCESSES 12

Reciprocating continuous mould process – Direct chill process – Use of steel, Aluimium, brass material in continuous casting. CO_2 Mould / Core hardening process – Principle of full Mould process – Applications , Special processes like Squeeze castimg and eletroslag casting processes.

TOTAL NO. OF PERIODS: 45

References :

1. P.L. Jain, Foundry Technology, 1992.
2. R.A.Higgins, Engineering Metallurgy – Vol. II, 1998.

BME010 EXPERIMENTAL STRESS ANALYSIS 3 0 0 3

OBJECTIVES

To bring awareness on experimental method of finding the response of the structure to different types of load.

Course Outcomes:

Student will

CO1: Understant the concept of stress and strain.
CO2: Understand the stress and strain behavior of solids.
CO3: Will able to measure strain on systems.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				W				S				S
CO2		M				S			M			
CO3				W								M
CO4												

CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I STRESS 9

Stress at a point-Stress equations of Equilibrium-Laws of stress transformation-Principal stresses-Maximum Shear Stress-Dimensional state of stress.

UNIT II STRESS AND STRAIN BEHAVIOUR OF SOLIDS 9

Tension, Compression and Shear, Normal stress and strain, Statically indeterminate problems-Strain energy in tension and impact loads-Strain energy due to bending, torsion, Shear stress and strain –Allowable stress-Stress concentration.

UNIT III STRAIN MEASUREMENT 9

Strain-Relation to experimental determination-Properties of strain Gauge systems-Displacement field approach to Moire fringe analysis-Out of plane measurements experimental procedure.

UNIT IV PHOTO ELASTICITY METHODS 9

Temporary double refraction-stress optic law-Effects of stressed model in a plane polariscope fringe multiplication-Ischromatic fringe patterns-Isoclinic fringe pattern compensation techniques-Calibration methods-Separation methods-Scaling model to photo types stresses-Materials

UNIT V BIREFRIGENT COATINGS 9

Coating stresses and strains-sensitivity-materials and applications-effect of thickness-stress separation

TOTAL NO. OF PERIODS: 45

References:

1. Dove Adams, Experimental Stress Analysis, Mc Graw Hill, 1992.
2. James Dalley, W.F. Riley, “Experimental Mechanics”, int. Student Edition McGraw Hill,

Kogakusha Ltd., 1992.
3. Perry and Lissiener, “Strain Gauge Primer”, McGraw Hill, 1965.
4. Durelli, Photomechanics, Prentice Hall, 1972.

BME011 MECHANICAL VIBRATIONS 3 0 0 3

OBJECTIVES

The student will be able to understand the sources of vibration and noise in automobiles and make design modifications to reduce the vibration and noise and improve the life of the components

Course Outcomes:

At the end of this course, students shall be able to

CO1:Understand the sources of vibration and noise in various appliences.
CO2:Will able to make design modification to reduce vibration.
CO3:Will produce life improved components.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			W			S						
CO2								W				
CO3							S			M		
CO4												
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I **9**

Vibration principle- Equilibrium & Energy methods- Free vibrations-Viscous & coulomb damping- Forced vibration EXCITATION- Transmissibility –Resonance -Characteristics.

UNIT II **9**

Two degrees of freedom –Matrix form – Undamped free vibration – Principal modes – Co-ordinate coupling – Principal co-ordinates – Torsional vibrations – Holzer method – Work & Energy approach.

UNIT III **9**

Transient vibration – Time dependency – Laplace transforms – Step inputs – Pulse inputs – Duhamel's integral – Phase plane method – Shock spectrum.

UNIT IV **9**

Multi degrees of freedom – Equations of motion – Solution –Orthogonality of normal modes – Continuous system – Free & forced vibrations – Vibration analysis by FEM.

UNII V **9**

Vibration instruments – Vibration absorber –Elastically supported dampers – Seismic instruments –Vibrometers – Pickups – Accelerometers – Mounting instruments – Amplitude & phase distortions.

TOTAL NO. OF PERIODS: 45

References:

1. W.T.Thomson – Theory of vibrations,Uniwin Hyman Ltd/CBS Publishers,1998.
2. Francis S.Tse, Iran E. Morse, Rolland T. Hinkle- Mechanical vibrations - CBS Publishers, 1983.
3. G.K.Grover – Mechanical Vibrations – Namchand & Bros. 2001.
4. V.P.Singh - Mechanical Vibrations –Dhanpat Rai & Co, 2005.
5. S.P.Timoshenko – Vibration Problems in Engineering – CBS Publishers, 1985.

BME012 TRIBOLOGY 3 0 0 3

OBJECTIVES

To equip student in Tribology which deals with friction, wear, and lubrication.

This course will approach tribology in terms of both the science of basic mechanisms, and the technologies of design, manufacture and maintenance.

Course Outcomes:

At the end of this course, students shall be able to

CO1: Understand the technologies of interacting surfaces in relative motion, thus encompassing all aspect of friction, lubrication and wear.
CO2: will learn the engineering aspects of tribology which you can apply in product development, failure analysis, condition monitoring etc.
CO3: Will able to design different tribological equipments.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				W								M
CO2		W				W		S			M	
CO3		M									M	
CO4												
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I SURFACE FRICTION 9

Topography of the surfaces – Surface features, surface interaction – Theory of friction – Sliding and Rolling friction – Friction properties of Metallic and non metallic materials – Friction in extreme conditions.

UNIT II WEAR 9

Wear – Types of wear – Mechanism of wear – Wear resistance materials – Surface treatment – Surface modifications – Surface coatings.

UNIT III LUBRICATION THEORY 9

Lubricants and their properties – Reynolds Equations, Thermal , Inertia and Turbulent Effects – Elasto hydrodynamic and plasto hydrodynamic and Magneto hydrodynamics lubrication – Hydrostatic lubrication – Gas lubrication.

UNIT IV DESIGN OF JOURNAL BEARINGS 9

Design and Performance analysis of thrust of Journal bearings – Full, Partial, Fixed and pivoted Journal bearing design – Lubrication flow and delivery – Power loss, Heat and temperature rotating loads and dynamic loads in journal bearings – Hydrodynamic bearing design.

UNIT V ROLLING ELEMENT BEARINGS 9

Geometry and Kinematics – Materials and Manufacturing process – Contact stress – Hertzian stress equations – Stresses and deflections – Axial loads and rotational effects, Bearing life capacity and variable loads – Oils film and their effects – Rolling bearing failure.

TOTAL NO. OF PERIODS: 45

References:

1. Cameron A. “Basic Lubrication theory” , Ellis Hardward Ltd.U.K.1987.
2. Willing J.A. “ Engineering Tribology”, Oxford Univ Press,1994.
3. Hulling J.(Editor) – “Principles of Tribology ”,Macmillan ,1984.
4. PSG Design Data Book, 2003.

BME013 DESIGN FOR MANUFACTURING 3 0 0 3

OBJECTIVES

- The aim is to impart the students with knowledge of the general design principles of manufacturing and to provide complete informations for further study.
- At the end of this course the student should be able to understand the design principles of casting, welding, forming, machining and assembly, by considering various manufacturing constraints.

Course Outcomes:

At the end of this course, students shall be able to

CO1: Will understand design principles of manufacturing.

CO2:Will understand design principles of casting, welding , forming, machining.

CO3:Will understand manufacturing constrains.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	W					W			M			
CO2	W			M					S			
CO3	W					S			S			
CO4												
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I **9**

General design principle for manufacturing - Process capability- Surface finish – tolerances – features of tolerance – cumulative effect of tolerance – Geometric tolerances.

UNIT II **9**

Fits- Selective assembly- Deciding the number of groups, control of axial play- Grouped datum systems- Types- Automated assemblies- laminated shims assemblies.

UNIT III **9**

True position theory- Virtual size concept- True position tolerancing- fixed fasteners- Floating fasteners- zero true position tolerances- Functional gauging- paper layout gauging.

UNIT IV **9**

Form design of castings- Redesigning- Parting line consideration- Minimizing core requirements- economic design of castings- Form design of weldments- Welding symbols- redesigning cast members using weldments- Economic weldments.

UNIT V **9**

Design for assembly- Design for inspection- Design for machining- Redimensioning based on manufacturing datums- Design of reduce value addition – Parts cut to length – Machined round holes- Blind & Through holes – Design consideration for various machining operations.

TOTAL NO. OF PERIODS: 45

References:

1. M.F.Spotts – “Dimensioning & Tolerancing for Quantity Production” – Prentice Hall
2. Harry Peck – “Designing for Manufacture” – Pitman Publications, 1973.
3. James G.Bnalla- “Hand book of Product Design for Manufacturing”.

BME014 PLANT LAYOUT AND MATERIAL HANDLING 3 0 0 3

OBJECTIVES

To equip students with adequate knowledge for running of organization and to understand the integration of material handling systems.

Course Outcomes:

At the end of this course, students shall be able to

CO1: understand the procedures for systematic integeration of organization.
CO2:Will understand various techniques and tools of layout planning.
CO3: Will able to visualize the industrial layouts.
CO4: Will able to make effective industrial layouts.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M							M			
CO2					W				W			
CO3				W					M			
CO4						S						
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I PLANT LOCATION AND FACILITIES 8

Factors to be considered – influence of location on plant layout, selection of plant site, Consideration in facilities planning and layout. Equipments required for plant operation, Capacity, serviceability and flexibility and analysis in selection of equipments, space requirements, and man power requirements.

UNIT II PLANT LAYOUT 8

Need for layout, types of layout, factors influencing product, process. Fixed and combination layout: tools and techniques for developing layout, process chart, flow diagram, string diagram, template and scale models – machine data. Layout planning procedure. Visualization of layout, revision and improving existing layout, balancing of fabrication and assembly lines.

UNIT III MATERIAL HANDLING 10

Importance and scope. Principles of material handling. Planning, operating and costing Principles, types of material handling systems, factors influencing their choice.

UNIT IV INDUSTRIAL BUILDING AND UTILITIES 12

Centralized electrical, pneumatic water line systems. Types of buildings, lighting, heating, air conditioning and ventilation utilities - planning and maintenance, waste handling, statutory requirements. Packing and storage materials: Importance of Packaging, layout for Packaging – Packaging machinery – wrapping and Packing materials, cushion materials.

UNIT V ANALYSIS OF MATERIAL HANDLING 7

Motion analysis, flow analysis, graphic analysis, safety analysis, equipment cost analysis, palletization analysis, analysis of operation, material handling surveys.

TOTAL NO. OF PERIODS : 45

Text Books :

1. S. C. sharma, Plant layout and material handling, Khanna publishers.
2. Agarwal, Plant layout and material handling, Jain brothers publication.

References :

1. Shubin J A, Plant layout, P H I publications.1965
2. Oberman. Ya, Material handling, Mir publishers.1980
3. S.C. Sharma, Material Management And Material Handling, Khanna Publishers.1995

BME015 MECHANICS OF FRACTURE 3 0 0 3

OBJECTIVES

The purpose is to give an introduction about fundamental theory in facture mechanics. Knowledge of failure mechanisms and the fracture mechanics is important in many fields of research and industrial applications..

Course Outcomes:

At the end of this course, students shall be able to

CO1: The student will develop skills in deriving stress field and energy release rate around the crack tip and crack propagation under cyclic loading.
CO2: Understanding of facture mechanics and its application.
CO3: will be achieved and knowledge of solution methods used for different problems.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		W						S				
CO2		W		M		S			M			
CO3		W								S		
CO4												
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I INTRODUCTION &ELASTIC CRACK 9

Introduction-Crack in a structure-Griffith criterion cleavage fracture, ductile fracture, fatigue cracking- Service failure analysis. Elastic crack-Elastic crack tip stress field- Solution to crack problems, Effect of finite size stress intensity factor-Special cases- Irwin plastic zone correction – Actual shape of plastic zone- plane stress- plane strain.

UNIT II ENERGY PRINCIPLE 9

Energy release rate- criterion for crack growth- Crack resistance curve-Principles of crack arrest-Crack arrest in practice.

UNIT III FATIGUE CRACK GROWTH 9

Fatigue crack growth test, stress intensity factor, factors affecting stress intensity factor-variable amplitude service loading, retardation model.

UNIT IV ELASTIC PLASTIC FRACTURE MECHANICS 9

Elastic plastic fracture concepts- crack tip opening displacement- J using FEM.

UNIT V APPLICATIONS OF FRACTURE MECHANICS 9

Fracture design- selection of materials-Fatigue crack growth rate curve- stress intensity factor range- Use of crack growth law.

TOTAL NO. OF PERIODS: 45

References:

1. John M.Barsom and Stanley T Rolfe, “Fracture and fatigue control in structures”, Prentice Hall, Inc, USA, 1987.
2. David Broek- “Elementary engineering fracture mechanics” Martinus Nijh off publishers, 1982.
3. Jean lemative and Jean Louis chboche “Mechanics of solid Materials,” Cambridge university press, Cambridge, 1987.
4. Prashant Kumar, Elements of fracture mechanics, wheeler publishing, 1999.

S

BME 016 WIND AND SOLAR ENERGY 3 0 0 3

OBJECTIVES

To equip students with adequate knowledge on the need for alternate energy sources, Potential of solar and wind options.

Course Outcomes:

At the end of this course, students shall be able to

CO1: Do wind rotor design and modeling
CO2: Able to do performance estimation of wind rotors.
CO3: Will understand the concept of solor energy and it application.
CO4: Will have knowledge on solor energy storage system.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		W		M					M			
CO2		W					M				S	
CO3		W			S							
CO4												
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I WIND ROTOR AND ITS MODELING 9

Scope of wind power, wind turbine design- Approach elementary aerodynamic models for rotors, Ranking- Fronde actuator disc theory- Wake rotation ,two dimensional air foil theory, Glauert momentum vortex theory-Optimal rotor – Modification, Experimental verification of aero dynamic model.

UNIT II WIND ROTOR DESIGN AND PERFORMANCE ESTIMATION 9

Wind model rotor sizing- Rotor specification, Rotor design – Number of blades, blade design. Performance estimation, sitting economics of wind power.

UNIT III 9

General requirements, synchronous generators, Induction generators-Squirrel cage-Variable speed-Wound rotor-Resistance controlled-with cyclone converter-practical aspects. Speed control-Stall and Pitch control-Electronic control, power control, Electrical cut-in.

UNIT IV SOLAR ENERGY 9

Principle of conversion of solar radiation into heat, types of solar thermal collectors-Flat plate and concentrating collectors(parabolic, trough, Minor ,strip, Fresnel lens and compound parabolic concentrator),compression of collectors selective absorber coating, solar thermal power plant.

UNIT V SOLAR ENERGY STORAGE AND APPLICATIONS 9

Solar energy storage systems-Thermal, Electrical, Chemical, Mechanical and Electro-magnetic, Solar pond. Applications of solar energy-Solar thermo electric conversion-Solar photo voltaic, Solar heating and cooling of buildings, Solar distillation, Solar pumping and terrestrial application. System of solar cell power plant-direct grid connection through electronic control devices.

TOTAL NO OF PERIODS: 45

References:

1. David M. Eggleston and Forrest S.Stoddard, Wind Turbine Engineering Designing – Van Noustrand 1987.
2. Rai G.D. , Non – Conventional sources of energy, Khanna Publications, 4th edition, 2004.
3. Le Gouries D, Wind Power Plants, Theory and Design - Permagon Press, 1982.
4. Putnam Palmer C., Power from Wind – Van Noustrand, 1984.

BME017 ADVANCED TURBO MACHINES 3 0 0 3

OBJECTIVES

To develop skilled manpower in the field of turbomachines with the knowledge of transport processes through the turbomachine passage, analytical, numerical and experimental tools for design, operation, performance evaluation and innovative research in the area of turbomachines”

Course Outcomes:

At the end of this course, students shall be able to

CO1: Understand the performance evaluation, operation and maintenance of rotodynamic machines.

CO2: Will have knowledge on conceptual design of different components of thermal and hydroturbomachines.

CO3: Design and develop turbomachineries.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M		M					W			
CO2		W					M				S	
CO3		S		W	S							
CO4												
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I PRINCIPLES 9

Energy transfer between fluid and rotor, classification of fluid machinery, dimensionless parameters, specific speed, applications, stage velocity triangles, work and efficiency for compressors and turbines.

UNIT II 9

Types, stage and design parameters, flow analysis in impeller blades, Volute and diffusers, losses, characteristics curves and selection, fan drives and fan noise.

UNIT III CENTRIFUGAL COMPRESSOR 9

Construction details, types, impeller flow losses, slip factor, diffuser analysis, losses and

performance curves.

UNIT IV AXIAL FLOW COMPRESSOR 9

Stage velocity triangles, enthalpy-Entropy diagrams, stage losses and effiency, workdown factor, simple stage, design problems and performance characteristics.

UNIT V AXIAL AND RADIAL FLOW TURBINES 9

Stage velocity diagrams, reaction stages, losses and coefficients, blade design principles, testing and performance characteristics.

TOTAL NO. OF PERIODS: 45

References:

1. S.M.Yahya – Turbines, Compressors and Fans – Tata McGraw Hill Publishing Company, 2005.
2. V.Ganesan – Gas Turbines - Tata McGraw Hill Publishing Company, New Delhi- 2003.

BME018 COMBUSTION ENGINEERING 3 0 0 3

OBJECTIVES

To understand the thermodynamics and kinematics of combutions.

To understand and analyze the combustion with emphasis on engineering applications.

Course Outcomes:

At the end of this course, students

CO1: Will have information on various types of fuels, their property and characterization. **CO2**: Will understand combustion and its types.
CO3: Will iunderstand the concept of combustion of different fuels.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		W			W			M				
CO2			S							M		
CO3						S		W				M
CO4												
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I CHEMICAL REACTIONS 9

Fuels and combustion, Theoretical and actual combustion processes, Enthalpy of formation and enthalpy of combustion, First law analysis of Reacting systems, Adiabatic flame temperature, Entropy change of reacting systems, Second law analysis of reacting systems, problems

UNIT II COMBUSTION OF GASEOUS AND VAPORIZED FUELS 9

Review of types of fuels, Types of flames, Energy balance and furnace efficiency, Burner type, Emissions from gas-fired furnaces, Emissions control, Chamber design, Detonation

UNIT III COMBUSTION OF LIQUID FUELS 9

Spray combustion in furnace, spray formation and droplet behaviour, Gas turbine operating parameters, combustor design, ignition delay, and detonation of liquid fuel sprays

UNIT IV COMBUSTION OF SOLID FUELS 9

Drying of solid fuels, devolatilization of solid fuels, stoker-fired boilers, Refuse and biomass fired boilers, Pulverized coal-burning systems, Pulverized coal combustion, Emission from pulverized coal, Problems

UNIT V FLUIDIZED BED COMBUSTION 9

Fluidization fundamentals, combustion in bubbling bed, atmospheric fluidized bed combustion

systems, circulating fluidized beds, pressurized fluidized bed combustion, problems.

TOTAL NO. OF PERIODS: 45

References:

1. Gary.L.Borman, Combustion Engineering-McGraw Hill international Edition,1998
2. Roger.A.Strehlow-Combustion fundamentals- McGraw Hill international Edition,1989
3. Yunus.A.Cengel-Thermodyn

BME019 COMPUTATIONAL FLUID DYNAMICS 3 0 0 3

OBJECTIVES

- To impart the knowledge of numerical techniques to the solution of fluid dynamics and heat transfer problems.
- To introduce Governing Equations of viscous fluid flows
- To enable the students to understand the various discretization methods, solutionprocedures and turbulence modeling.
- To create confidence to solve complex problems in the field of fluid flow and heat transfer by using high speed computers.

Course Outcomes:

At the end of this course, students shall be able to

CO1: Will aquir knowledge of numerical techniques to the solution of fluid dynamics and heat transfer problems.

CO2: Will get introduced to Governing Equations of viscous fluid flows

CO3:students will be enabled to understand the various discretization methods, solutionprocedures and turbulence modeling.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	W		S			S			M			
CO2						W			M			
CO3					S							W
CO4												
CO5												

Course Assessment Method

Direct	Indirect
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I GOVERNING DIFFERENTIAL EQUATIONS 9

Conservation of chemical species-The energy equation-Momentum equation-time averaged equations for turbulent flow-Turbulence-Kinetic energy equation-The general differential equation-Nature of co-ordination-Independent variable-Choice of co-ordinates-one way and two way coordinates

UNIT II DISCRETIZATION METHODS 9

Nature of numerical methods-Methods of deriving of discretization equations-Taylor series formulation-Variational formulation-Methods of weighted residuals-Control volume formulation

UNIT III HEAT CONDUCTION, CONVECTION AND DIFFUSION 9

Steady One Dimensional Conduction- Two and three dimensional conduction-Steady one dimensional convection and diffusion-Discretization equations for two dimensional convection and diffusion

UNIT IV CALCULATION OF FLOW FIELD 9

Representation of pressure-gradient and continuity equation-stagged grid-momentum equations-pressure and velocity correction-pressure correction equation. Introduction to Finite Element Method-solution of steady heat conduction by FEM-incompressible flow-simulation by FEM.

UNIT V TURBULENCE AND ALGEBRAIC MODELS 9

One, two equation model-high and low Reynolds number models-Reynolds stress models-Prediction of fluid and heat transfer using standard codes.

TOTAL NO. OF PERIODS: 45

References:

1. K.Muralidhar & T.sundarrajan- Computational Fluid Flow and Heat Transfer-Narosa, 2003
2. P.S.Ghoshdastidar-Computer Simulation of Flow and Heat Transfer-Tata Mcgrawhill Publishing Company Ltd 1998.
3. H.K.Versteeg & W.Malalasekara-An Introduction to Computational Fluid Dynamics-

Longman

BME020 VIBRATION CONTROL AND CONDITION MONITORING 3 0 0 3

OBJECTIVES

To presents fundamentals to a modern treatment of vibrations, placing the emphasis on analytical developments and computational solutions. This course will provide the detail knowledge about nonlinear and random vibration with fault diagnosis of machinery using vibration signature analysis.

Course Outcomes:

At the end of this course, students shall be able to

CO1: Understand the concept of vibration
CO2: Understand the concept of damping
CO3: Understand the concept of vibration control.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M				S						
CO2		M						S			W	
CO3		M		W			M					
CO4										W		
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I INTRODUCTION 9

Review of fundamentals of single degree of freedom systems- Two degree of freedom systems- Multi degree freedom systems- Continuous system- Determination of Natural frequencies and mode shapes. Numerical methods in vibration analysis.

UNIT II VIBRATION CONTROL 9

Introduction – Reduction of vibration at source- Control of vibration- By structural Design- Material selection- Located Additions- Artificial Damping- Resilient Isolation, Vibration Isolation- Vibration Absorbers.

UNIT III ACTIVE VIBRATION CONTROL 9

Introduction - Concepts and Applications- Review of Smart Materials- Types and Characteristics Review of Smart Structures- Characteristic Active Vibration in Smart Structures.

UNIT IV CONDITION BASED MAINTANENCE PRINCIPLES AND APPLICATION 9

Introduction- Condition Monitoring methods- The design of Information system, Selecting Methods of Monitoring, Machine Condition Monitoring and Diagnosis- Vibration Severity Criteria Machine Maintenance Techniques- Machine Condition Monitoring Techniques- Vibration Monitoring Techniques- Instrumentation Systems- Choice of Monitoring Parameter.

UNIT V DYNAMIC BALANCING AND ALIGNMENT OF MACHINERY 9

Introduction, Dynamic Balancing of Robots, Field Balancing in one Plane, Two Planes and in Several Planes- Machinery Alignment, “Rough” Alignment methods- The face Periphery Dial Indicator Method- Reverse indicator method.

TOTAL PERIODS:45

References:

1. Singiresu S.Rao. “Mechanical Vibration”. Addison- Wesley Publishing Co.2004
2. Rao J.S. “Vibratory Condition Monitoring of Machines” CRC Press. 2000.
3. J.O. Den Hartog- “Mechanical Vibrations” McGraw Hill New York.1985.
4. Science Elsevier-“Hand book of Condition Monitoring” ELSEVIER SCIENCE,1996.

BME 021 RAPID PROTOTYPING 3 0 0 3

OBJECTIVES

- To provide knowledge on different types of Rapid Prototyping systems and its applications in various fields.
- Generating a good understanding of RP history, its development and applications. Expose the students to different types of Rapid prototyping processes, materials used in RP systems and reverse engineering.

Course Outcomes:

At the end of this course, students shall be able to

CO1:Will understand Rapid Prototyping systems and its applications in various fields.
CO2:Will get a good understanding of RP history, its development and applications.
CO3:Students will be exposed to different types of Rapid prototyping processes, materials used in RP systems and reverse engineering.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			M						S		S
CO2	S			M			W			M		S
CO3	S			M		W						S
CO4												
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I INTRODUCTION 10

Basic operation –impact of rapid proto typing and tooling on product development- benefits-applications.

UNIT I RAPID PROTOTYPING PROCESSES 10

Introduction –Classification-laminated object manufacturing-fused deposition modeling-stereolithography-solid ground curing –selective laser sintering-3D printing

UNIT III CADPROCESSES 10

Introduction –data requirements-solid modeling –surface modeling .geometric processing – interface formats-model preparation-slicing, support structures and machine instructions

UNITIV MATERIALS FOR RAPID PROTOTYPING 5

Plastics- resins -metals-ceramics selection of materials for suitable processes – advantages-limitations

UNIT V RAPID TOOLING PROCESSES 10

Introduction - Classification in direct rapid tooling-silicon rubber Moulding-epoxy Moulding-electro forming-vacuum casting-vacuum forming-rapid tools for injection Moulding – direct rapid cooling processes –SLS rapid tool- shape deposition manufacturing- laser deposition lamination-rapid tooling roots

OTAL NO OF HOURS : 45

Textbooks

1. Ibrahim Zeid, CAD/CAM theory and practice, Tata Mc Graw hill, 2005

References

1. Paul F. Jacobs, RapidProtoTyping and Manufacture. Fundamentals of Stereolithography,1995
2. RapidProtoTyping reports, CAD/CAM publishing ,1991
3. Rapid news, University of Warwick. UK 1995
4. Rapid tools for Injection Moulding (www.vmreg.com/raptia/reports/CRIF.pdf)
   Applications of RP techniques for sheet metal forming (www.raptia.org)
   Medical RP applications (http://home.att.net/-rppat /museum/mus-5.htm)

BME 022 MANUFACTURING OF ELECTRONIC COMPONENTS 3 0 0 3

OBJECTIVES

- This course aims at providing knowledge in the field of electronic manufacturing and packaging.
- Upon completion of this course students will able to
- Understand various steps in wafer preparation
- Describe the method of manufacture and types of Printed circuit board(PCB)
- Describe various components in THT and SMT

- Explain Soldering and cleaning in Electronic packaging
- Describe Surface Mount Technology (SMT)
- Explain inspection, testing and rework of populated PCB.

Course Outcomes:

At the end of this course, students shall be able to

CO1:Student will get knowledge in circuit and circuit theory.
CO2:Will understand various steps in wafer preparation.
CO3:Find out the method of manufacture and types of Printed circuit board(PCB).
CO4:Will understand various components in THT and SMT.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		W							M			W
CO2				S			S		M			S
CO3					M				M			
CO4												
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I MICROELECTRONIC PROCESSES 13

Atomic structure. Wafer preparation by growing, machining and polishing. Diffusion. Microlithography. Etching and cleaning. Energy beam processes using photon, electron and ion. Ion implantation. Chemical vapor deposition. Physical vapour deposition. Epitaxial process. Applications to micro chips and micro electrical and mechanical devices

UNIT II INTERCONNECTIONS AND PRINTED WIRING BOARD MANUFACTURER 10

Through-hole components. Surface – mount components. Component manufacturing. Wire

bonding technology . Tape automated bonding. Multiple chip modules. PWB types. Substrate materials. Fabrication procedures. Image transfer. Plating. Plated-through holes, Etching. Solder-masking. Multi-layer board.

UNIT III SOLDERING AND CLEANING 7

Wave soldering. Adhesive and solder paste application. Solder materials. Solder system variables. Soldering temperature profile. Reflow theory and alternatives. Soldering quality and defects. Post solder cleaning and selection. Measurement of cleanliness levels.

UNIT IV AUTOMATIC ASSEMBLY FOR PCB 8

Assembly process variation. Component handling. Automated component placement/insertion. Surface mount technology (SMT). Robotic marking and assembly. Placement accuracy requirements. Machine vision, X-ray and laser inspection.

UNIT V INSPECTION, TEST AND REWORK FOR PCB 7

Inspection philosophy and techniques. Component placement and joining quality. Concept of yield. In-circuittest.functional test. Environment stress screening. design for testability. design for reparability. Repair process. Field repair strategy.

TOTAL NO OF HOURS : 45

Textbooks

1. VLSI Technology, edited by C.Y.chang, S.M.Sze. call number : TK7874.76.U46, Publisher: Newyork; Singapore: McGraw-Hill, c1996 (call number : TK7874.76.U46)

References

1. Microchip Fabrication – a practical guide to semiconductor processing, by
2. Peter Van Zant, 4th Ed. McGrawHill, 2000(call number: TK7871.85.V217
3. Electronics manufacturing processes ,by Thomas L .Landers, alet .Prentice hall
4. Packaging of electronic systems: a Mechanical Engineering Approach, by
5. James W. Dally, McGraw-hill
6. Prasad,R.P. “Surface Mount Technology: Principles and Practice”, New York:
7. Chapman and Hall, 1997 (call number :

BME023 GAS DYNAMICS AND SPACE PROPULSION 3 0 0 3

OBJECTIVES

- To impart knowledge to the students on compressible flow through ducts, jet propulsion and space propulsion.
- To understand the basic difference between incompressible and compressible flow.

- To understand the phenomenon of shock waves and its effect on flow. To gain some basic knowledge about jet propulsion and Rocket Propulsion.

Course Outcomes:

At the end of this course, students shall be able to

CO1: Will get knowledge to the students on compressible flow through ducts, jet propulsion and space propulsion.

CO2: Will understand the basic difference between incompressible and compressible flow.

CO3: Will understand the phenomenon of shock waves and its effect on flow.

CO4: Will have some basic knowledge about jet propulsion and Rocket Propulsion.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S									S	
CO2			S	W		M		W	M			M
CO3					W							
CO4												
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I BASIC CONCEPTS OF COMPRESSIBLE FLOW 9

Compressible fluid flow-energy and momentum equations, stagnation stages, various regions of flow, reference velocities, effect of Mach number on compressibility. Types of waves, Mach cone, Mach angle.

UNIT II FLOW THROUGH DUCTS 9

Flow through variable area ducts-nozzles and diffusers, Mach number variation, stagnation and critical states, area ratio as a function of Mach number.

Flow through constant area ducts-with friction (Fanno flow), with heat transfer (Reyleigh flow),

Variation of flow properties. Use of Gas Tables and Charts.

UNIT III **9**

NORMAL AND OBLIQUE SHOCKS

Governing equations, variation of flow parameters across the normal and oblique shocks. Prandtl Meyer relations. Flow in variable area ducts with normal shocks. Use of Tables and Charts.

UNIT IV JET PROPULSION **9**

Types of jet engines-turboprop, turbojet, ramjet, pulsejet. Aircraft propulsion theory, performance analysis of jet engines, parameters affecting flight performance, thrust augmentation.

UNIT V ROCKET PROPULSION **9**

Types of rocket engines, propellants, combustion instabilities, rocket propulsion theory, performance of rocket engine, multistage rockets, orbital and escape velocities.

TOTAL NO. OF PERIODS: 45

References:

1. Yahya S.M. Fundamentals of Compressible Flow, New Age International (P) Ltd., New Delhi, 2003.
2. Philip G Hill and Carl R. Peterton, Mechanics and Thermodynamics of Propulsion, Addison-Wesley Publishing Company, 1999.
3. Khajuria P.R and Dubey S.P., Gas turbines and Propulsive Systems, Dhanpat Rai Publications (P) Ltd, New Delhi 2003.
4. Cohen H. Rogers GFC, Saravanamuttoo HIH, Gas Turbines Theory, Addison-Wesley Long man Ltd., 2001.
5. Ganesan V, Gas Turbines, Tata McGraw-Hill Publishing Company Ltd., 2003.

BME024 PRINCIPLES OF MANAGEMENT AND ORGANIZATIONAL BEHAVIOUR **3 0 0 3**

OBJECTIVES

Familiarise the students with the fundamental concepts of Management and highlight approaches in organisation behavior

. **Course Outcomes:**

At the end of this course, students shall be able to

CO1: Understand the concept of organisation behavior.
CO2: Understand the management process and co-ordination.
CO3: Understand the Organizing Theory & Approach.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			W				W				M	
CO2											M	
CO3	M			S					W		M	
CO4												
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I **9**

Nature of management – definition – theory and practice – effective management – Management : Science of Art – Management in India. Development of Management thoughts – Taylor's – Henry Fayol – Hawthrone experiment – Barnard & Social system – Herbert Simon – Peter Drucker – Various approaches – Management thoughts.

UNIT II **9**

Management process and co-ordination – Functions of management – Managers and environment – External and internal Business Ethics – Planning – Fundamentals – Definitions & Features – Steps in planning – types of planning – Objectives – Concepts and features – Hierachy of objectives – role – Process of MBO – Policy & Strategy – Decision making process – Individual Vs Group Decisions.

UNIT III **9**

Organizing – Theory & Approach – Organization Structure – Authority & Responsibility – Delegation – Centralization & Decentralization – Line & Staff Relationship – Staffing –

Fundamentals – System approach – Manpower Planning – Recruitment & Selection – Training and development – Performance appraisal – Direction – Fundamentals Motivation – Theories of Motivation-Maslow's Hersberg's MaClelland's theory X,Y & Z leadership – Theories and Styles – Communication – Type – Controlling – System and Process.

UNIT IV **9**

Organizational Behaviour – Definition – Organization – Managerial Role and Functions – Organizational Approaches, Individual behaviour – Causes – Environmental effect – Behaviour and performance, perception – Organizational implications, Personality – Contributing factors – Dimension, Motivation – Need Theories – Process Theories – Job satisfaction, Learning and Behaviour – Learning Curves, Work Design and Approaches.

UNIT V **9**

Group Behaviour – Groups – Contributing factors –Group Norms, types – Causes – Intergroup relations – Conflict and Resolution – Change Process –Resistance to change.

TOTAL NO. OF PERIODS : 45

References :

1. Herald Knootz and Heinz weihrich, 'Essentials of Management', McGraw Hill publishing Company, Singapore International Edition, 2004.
2. Ties AF, Stoner and R. Edward Freeman, "Management" Prentice Hall of India Pvt. Ltd., New Delhi -110011, 1995.
3. Joseph I. Massie 'Essentials of Management', Prentice Hall of India Pvt. Ltd., New Delhi -110011, 2004.
4. L.M. Prasad "Principles and Practice of Management", Sultan Chand & Sons.2001
5. Uma Sekaran, "Organizational Behaviour", Tata McGraw Hill, 2007.

BME025 **PROFESSIONAL ETHICS** **3 0 0 3**

OBJECTIVES

- To learn about moral of professional ethics.
- To study case studies of ethics.
- To study about employee rights.

Course Outcomes

CO01 - To learn senses of ethics.
CO02 – To learn about codes of ethics.
CO03 – To study about assessment of safety and risk.
CO04 – To learn about intellectual property rights.
CO05 – To study about moral leadership.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S						S			M	
CO2		M	M	M								
CO3		W				S				M		
CO4									M			
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I ENGINEERING ETHICS 9

Human Values– Senses Of Engineering Ethics – Variety Of Moral Issues – Types Of Inquiry – Moral Dilemmas – Moral Autonomy – Kohlberg's And Gilligan's Theory – Consensus And Controversy – Models Of Professional Roles – Theories About Right Action –Self Interest – Customs And Religion – Use Of Ethical Theories.

UNIT II ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering As Experimentation – Engineers as Responsible Experimenters – Codes of Ethics - The Challenger, Case Study.

UNIT III ENGINEER'S RESPONSIBILITIES FOR SAFETY 9

Safety And Risk – Assessment Of Safety And Risk – Risk Benefit Analysis And Reducing Risk – The Three Mile Island , And Cher Nobyl Case Studies.

UNIT IV ENGINEERS'S RESPONSIBILITIES AND RIGHTS 9

Collegiality And Loyalty – Respect For Authority – Collective Bargaining – Confidentiality – Conflicts Of Interest – Occupational Crime – Whistle Blowing – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

UNIT V GLOBAL ISSUES 9

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development –Engineers As Managers – Consulting Engineers – Engineers As Expert Eye Witnesses And Advisors – Moral Leadership

TOTAL NO. OF PERIODS: 45

Text books:

1. Mike W Martin And Roland Schinzinger, Ethics In Engineering, Tata Mcgraw Hill,Newyork2005.
2. R S Nagaarazan, Textbook On Professional Ethics And Human Values, New Age International Publishers, 2006
3. Charles D Fledderman, Engineering Ethics, Prentice Hall, New Mexico, 2004

References:

1. Laura Schlesinger, How Could You Do That ? The Abdication Of Character, Couage, And Conscience, Harper Collins, Newyork 1996
2. Stephen Carter, Integrity, Basic Books, Newyork 1996

BME026 ENTREPRENEURSHIP DEVELOPMENT 3 0 0 3

OBJECTIVE:

- To learn about types of entrepreneurship.
- To study about major motivation methods.
- To study about government policies for small scale industries.

Course Outcomes

CO01 - To learn difference between entrepreneur and interpreneur.
CO02 – To learn about entrepreneurship development programs.
CO03 – To study about economic feasibility methods.
CO04 – To learn about taxation.
CO05 – To study about corrective measures methods.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	W						W					
CO2		S						S				
CO3				M						M		
CO4						S				M		

CO5												M

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I ENTREPRENEURSHIP 8

Entrepreneur- Types of Entrepreneurs - Difference Between Entrepreneur and Interpreneur- Role of Entrepreneurship in Economic Growth- Women and Rural Entrepreneurship - Factors Affecting Entrepreneurial Growth.

UNIT II MOTIVATION 8

Major Motives Influencing Entrepreneur – Achievement Motivation Training, Self Rating – Business Game – Thematic Apperception Test – Stress Management – Entrepreneurship Development Programs – Need, Objectives.

UNIT III BUSINESS 9

Small Enterprise – Definition, Classification – Characteristics- Ownership Structure – Project Formulation – Steps Involved in Setting up a Business – Identifying, Selecting a Good Business Opportunity- Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports- Project Appraisal- Sources of Information- Classification of Needs and Agencies.

UNIT IV FINANCING AND ACCOUNTING 10

Need – Sources of Finance- Terms Loans, Capital Structure- Financial Institutions, Management of Working Capital, Costing, Break Even Analysis, Network Analysis Techniques of PERT/ CPM –Taxation – Income Tax – Excise Duty – Sales Tax.

UNIT V SUPPORT TO ENTREPRENEURS 10

Sickness in Small Business- Concept, Magnitude, Causes and Consequences, Corrective Measures- Government Policy for Small Scale Enterprises- Growth Strategies in Small Industry – Expansion- Diversification, Joint Venture, Merger, Sub Contracting.

TOTAL NO. OF PERIODS: 45

Text Books:

1. S.S.Khanka, "Entrepreneurial Development", S. Chand & Co. Ltd., Ram Nagar, New Delhi, 1999.
2. Hisrich RD and Peters MP, "Entrepreneurship", 5th Edition, Tata McGraw Hill, 2002.

References:

1. Rabindra Kanungo, "Entrepreneurship and Innovation" , Sage Publications, New Delhi, 1999
2. ED II. Faculty & External Experts-A Hand book for New Entrepreneurs Publishers: Entrepreneurial Development, Institute Of India, and Ahmedabad, 1986.

BME027 MARKETING MANAGEMENT 3 0 0 3

OBJECTIVE:

- To learn about consumer marketing.
- To study about demographic factors.
- To study about retailing process.

Course Outcomes

CO1 - To learn marketing concepts between industry andconsumer.
CO2 – To learn about demographic factors.
CO3 – To study about pricing methods.
CO4 – To learn about portfolio analysis.
CO5 – To study about advertising and sales methods.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S				W						
CO2											W	
CO3					S							M
CO4												
CO5												

Course Assessment Method

Direct	**Indirect**

Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I INTRODUCTION 9

Definition- Marketing Process- Dynamics- Needs- Wants and demands-Marketing Concepts- Environment- Mix- Types- Philosophies- Selling Vs Marketing- Organizational- Industrial Vs Consumer Marketing- Consumer Goods- Industrial Goods- Product Hierarchy.

UNIT II BUYING BEHAVIOUR & MARKET SEGMENTATION 9

Cultural- Demographic Factors- Motives- Types- Buying Decisions- Segmentation factors- Demographic- Psychographic & Geographic Segmentation- Process- Patterns.

UNIT III PRODUCT PRICING AND MARKETING RESEARCH 9

Objectives- Pricing- Decisions & Pricing Methods- Pricing Management- Introduction- Uses- Process of Marketing Research.

UNIT IV MARKETING PLANNING AND STRATEGY FORMULATION 9

Components of marketing plan- Strategy formulation and marketing process- Implementation- Portfolio analysis- BCG- GEC grids.

UNIT- V ADVERTISING, SALES PROMOTION AND DISTRIBUTION 9

Characteristics- Impact- Goals- Types- Sales promotion- Point of Purchase- Unique selling proposition- Characteristics- Whole selling- Retailing- Channel Design- Logistics- Modern trends in retailing.

TOTAL NO. OF PERIODS: 45

Text Books:

1. Ramasamy and Nama kumari, “Marketing Environment: Planning, implementation and control the Indian context”,2002
2. Govindarajan.M, “Industrial marketing management:”, Vikas Publishing Pvt. Ltd, 2003

References:

1. Philip Kotler, Marketing Management, Analysis, Planning, Implementation and control, 1998.
2. Khanna O.P. – Industrial Engineering and Management, Khanna Publishers, New Delhi, 2000.
3. Green Paul.E and Donald Tull, “Research for marketing decisions”, Prentice Hall of India.

1995
4 .Donald S. Tull and Hawkins, “Marketing Research”, Prentice Hall of India- 1997

BME028 ENGINEERING ECONOMICS AND FINANCIAL ACCOUNTING 3 1 0 4

OBJECTIVE: To know about engineering economics and cost analysis.

Course Outcomes

CO1- To learn about introduction to economics.
CO2- To learn about value engineering.
CO3- To learn about cash flow.
CO4- To learn about economics of sampling and Replacement and Maintenance analysis.
CO5- To learn about depreciation and Evaluation of public alternatives.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		W						M		M		W
CO2												
CO3						S					S	
CO4				M								
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I 9

Introduction –Economics Theories And Scope –Demand And Supply Analysis –Determinants Of Demand –Law Of Demand – Elasticity Of Demand – Demand Forecasting –Demand Sensitivity –Price ,Income ,Gross ,Advertisement –Law Of Supply –Elasticity Of Supply –Cost Concepts – Types –Cost Curves –Short Run And Long Run –Break Even Analysis –Pricing Concepts –

Types ,Price –Determinations.

UNIT II **9**

Concepts–Firm, Industry, Market, Market power, Market Conduct, Market Performance. Market Structure- Types-Perfect Monopoly, Monopolistic and Oligopoly Competition. Manufacturing Practices-Diversification, Vertical and Horizontal Integration, Merger.

UNIT III **9**

National Income: Concepts and Measurements –GNP, NNP- Methods of Measuring National Income-Inflation and Deflation, Unemployment.

Money and Banking: Value of Money-Banking-Commercial Banks And Its Function. New Economic Environment: Economic Systems –Economic Liberalization, Privatization and Globalization

UNIT IV **9**

Introduction, Scope, Objectives, Basic Financial Concepts – Time Value Of Money And Method Of Appraising Project Profitability – Rate Of Return –Pay Back Period – Percent Value, NPV Comparison – Cost – Benefit Analysis. Source Of Finance – Internal And External –Long Term And Short Term – Securities, Debentures/ Bonds, Shares, Financial Institutions.

UNIT V **9**

Accounting System-Financial Statement – Types- Ledger, Cash Flow Statement Profit And Loss Account, Balance Sheet, Ratios/ Financial Analysis- Liquidity Leverage Activity, Profitability, Trends Analysis.

TOTAL NO. OF PERIODS: 45

References:

1. Maheshwari S N “Management Accounting and Financial Accounting”, S.Chand And Company. 1993.
2. D N Drivedi, “Managerial Economics “, Vikas Publishing House.1980
3. R R Barthwal, Industrial Economics “,Wiley Eastern Ltd1996
4. G S Guptha, “Management Economics “,Tata McGraw Hill Ltd
5. M Y Khan & P K Jain, “ Basic Financial Management “,Tata Mc Graw Hill Ltd2005

BME029 TOTAL QUALITY MANAGEMENT & RELIABILITY ENGINEERING

3 0 0 3

OBJECTIVE:

- To introduce the concept of quality management and reliability for the industrial field
- To acquaint the student with various technique used in quality management
- To introduce the various new trends in quality management

Course Outcomes

CO1 - To learn the concept of quality planning
CO2 – To understand the various techniques for total quality management
CO3 – To learn the various system components of TQM
CO4 – To learn the concept of reliability in TQM
CO5 - To learn the various technique for time maintainability

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	W					W				M		
CO2			S									
CO3				W				M			M	
CO4												W
CO5			S									

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I BASIC CONCEPTS ON QUALITY PLANNING 9

Definition of Quality – Deming – Miller – Crosby Theories – Service & Product Quality – Customer Orientation – Quality Control – Evolution of TQM – Inspection –QC- Planning – Smart Goal Setting – Design for Quality- Manufacturing for Quality.

UNIT II TQM TECHNIQUES 9

Scientific Based Approach to TQM, Data Based Approach –Statistical Methods– Quality Control Tools–New 7 Tools. Bench Marking–Definition–Types–Steps–Metrics–Case Studies-Quality Function Development–Definition–House of Quality– Preliminary Research to Conduct QFD – QFD Matrix–Benefit –Case Studies–Failure Mode and Effect Analysis–5S-Continuous Improvement Techniques–Pokayoke–Deming Wheel-Case Studies.

UNIT III HUMAN DIMENSION & SYSTEM COMPONENT OF TQM 9

TQM Mind Set –Participation Style – Team Work – Team Development – Quality Circle- Motivational Aspect – Change Management.

Documentation – Structure – Information System – ISO 9000 – ISO 14000 – QS 9000 Certification Clauses –Procures – TQM Road – Map Criteria – Road Map – Evaluation.

UNIT RELIABILITY 9

Introduction – Difference between Quality and Reliability- Definition – Probabilistic Nature of Failures – Mean Failure Rate – Mean Time to Failure – Mean Time between Failures – Hazard Rate – Hazard Models – Weibull Model – Improvement in System Reliability by Redundancy – Series – Parallel and Mixed Configurations.

UNIT V MAINTAINABILITY 9

Introduction – Difference between Maintainability and Serviceability – Maintenance Strategy – Mean Time to Repair (MTTR) – Mean Down Time (MDT) – Fault Diagnosis- Routine Test for Unrevealed Faults- Factors Contributing to Mean Maintenance to Time (MMT) – Periodic Condition Monitoring – Continuous Condition Monitoring – Economics of Maintenance.

TOTAL NO. OF PERIODS : 45

Text Books:

1. John Bank, Total Quality Management, Prentice Hall of India Pvt. Ltd, New Delhi 2000.

Reference Books:

1. Joel E. Rose, Total Quality Management – II Edition, Kogan Page Limited, USA 1993.
2. Samuel K Ho, TQM – An integrated Approach,II Edition, Kogan Page Ltd, USA 1993.
3. Charles Gervistz Developing New Products with TQM McGraw- Hill International Editions.
4. Dale H. Bester Field, Total Quality Management, Pearson Education, Low Price Edition, 2004.
5. Balagurusamy, E-Reliability Engineering, TMH, 1984.
6. Srinath I, Reliability Engineering , Affiliated East West Press, 1975

BME030 REFRIGERATION&AIR CONDITIONING 3 1 0 4

OBJECTIVES

- To understand the underlying principles of operation in different Refrigeration & Air conditioning systems and components.
- To provide knowledge on design aspects of Refrigeration & Air conditioning systems

Course Outcomes:

At the end of this course, students shall be able to

CO1:the students can able to demonstrate the operations in different Refrigeration & Air conditioning systems

CO2: Able to design Refrigeration & Air conditioning systems .

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				S				S			M	
CO2		W				M						W
CO3												
CO4												
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I METHODS OF REFRIGERATION 12

Review of thermodynamics, Principle of Refrigeration, Refrigeration methods-Air refrigeration (Theory only)-Bell-Coleman refrigeration, steam jet refrigeration, and Vapour compression refrigeration-Uses of P-H charts-Cascade refrigeration, Vapour absorption refrigeration, Comparison of performance and COP

UNIT II REFRIGERANTS, EQUIPMENTS & TESTING OF EFRIGERATINGUNITS 12

Refrigerants, properties - Selection of refrigerants. equipments-compressors-reciprocating, rotary, Condensers-evaporators-Cooling towers – Fans - Ducts

UNIT III PSYCHROMETRY AND COMFORT AIR CONDITIONING 12

Review of fundamental properties of air, Psychrometric processes -By pass factor-Requirement of comfort air-conditioning, Comfort and comfort chart, Factors governing optimum effective temperature

UNIT IV COOLING LOAD CALCULATIONS 12

Types of heat sources-Heat transmission through buildings, solar heating, Internal heat sources (Sensible &latent), outside air and fresh air load, Estimation of total load

UNIT V AIR CONDITIONING SYSTEMS AND APPLICATIONS 12

Air conditioning equipments-Air filters, humidifiers, dehumidifiers, air washer, Commercial &industrial air conditioning systems, central air conditioning system, Application of refrigeration-Ice plant, Food storage plants, milk chilling plants, cryogenic in medicine& biological use, application of Air conditioning system-Car Industry, Stores and Railway A/C

TOTAL NO. OF PERIODS: 60

Text books:

1. Manohar Prasad, Refrigeration & Air-conditioning, S.I version, Wiley Eastern Ltd, 1997.

References:

1. Roy.J.Dossat-Principles of Refrigeration-low price edition, 2001
2. C.P.Arora-Refrigeration & Air conditioning, Tata Machine graw hill, 2000
3. Jordon and Prister, Refrigeration and Air-conditioning-Tata McGraw Hill.

BME031 PROCESS PLANNING AND COST ESTIMATION 3 0 0 3

OBJECTIVES

To introduce the process planning concepts to make cost estimation for various products after process planning

Course Outcomes:

At the end of this course, students shall be able to

CO1: the students can able to use the concepts of process planning and cost estimation for various products.

CO2: Able to fix product cost aqurately .

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M				W				W		
CO2				M				M				
CO3												
CO4												
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I PROCESS PLANNING 12

Types of production, standardization, simplification, production design and selection - Process Planning, selection and analysis – Steps involved in manual and experienced based planning and computer aided process planning – Retrieval, Generative – Selection of process analysis – Break even analysis.

UNIT II ESTIMATION AND COSTING 12

Aim and objective of cost estimation – Functions of estimation – Costing – Importance and aims of costing – Difference between costing and estimation. Importance of realistic estimates – Estimation procedure.

UNIT III COST ELEMENTS 12

Material cost – Determination of material cost, Labour cost - Determination of labour cost, Expenses — Analysis of overhead expenses – Factory expenses, Administrative expenses – Selling and Distributing expenses – Allocation of over head expenses. Cost of product – Illustrative examples

Depreciation: Depreciation – Causes of Depreciation – Methods of Depreciation.

UNIT IV ESTIMATION OF PRODUCTION COST 12

Estimation in forging shop – Losses in forging – forging cost – Illustrative examples. Estimation

in welding shop – Gas cutting – Electric welding - Illustrative examples. Estimation in foundry shop – Estimation of pattern cost and casting cost - Illustrative examples.

UNIT V MACHINING TIME ESTIMATION 12

Estimation of Machining Time for Lathe operations – Estimation of Machining Time for Drilling, Boring, Shaping, Planning, Milling and Grinding operations - Illustrative examples.

TOTAL NO. OF PERIODS: 60

References :

1. M.Adithian and B.S. Pabla, Estimation and Costing, Konark publishers Pvt. Ltd., 1989.
2. A.K.Chitale and R.C.Gupta, Product Design and Manufacturing, Prentice Hall Pvt. Ltd.., 2005.
3. Namua Singh, System Approach to computer integrated Design and Manufacturing, John Wiley & Sons,Inc.,1996.
4. Joseph G Monks, Operation Management, Theory & Problems, McGraw Hill Book Company, 1987.
5. T.R.Banga and S.C.Sharma, Estimations and Costing, Khanna Publishers,1988.
6. G.B.S.Narang and V.Kumar, Production and Costing, Khanna Publishers, 1995.

BME032 JIGS, FIXTURES & PRESS TOOLS 3 0 0 3

OBJECTIVES

To understand the functions and design principles of Jigs, fixtures and press tools
To gain proficiency in the development of required views of the final design.

Course Outcomes:

At the end of this course, students shall be able to

CO1: Will have knowledge on standard components

CO2:the students can able to design jigs, fixtures for specific application.

CO3: Will have knowledge on presstools

CO4: Able to design various dies.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M				S			S			
CO2	W								S			
CO3		W							S			M
CO4		W										
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I LOCATING AND CLAMPING DEVICES 12

Introduction to jigs & Fixtures - Design principles of jigs & fixtures - Locating principles and elements – Standard parts – Clamping devices, Mechanical ,Pneumatic and hydraulic actuation, Clamping force analysis.

UNIT II JIGS 12

Drill bushes - Different types of jigs- plate, latch, channel, box, post, angle plate, angular post, turnover, pot jigs - Automatic drill jigs – Rack & pinion operated and Air operated jig components - Design and development of jigs for the given components.

UNIT III FIXTURES 12

Types of fixtures - Boring, Lathe, Milling, Broaching fixtures – Grinding, Planning and Shaping fixtures – Assembly, Inspection and Welding fixtures – Modular fixtures – Design and development of fixtures for the given components.

UNIT IV PRESS TOOLS 12

Press working terminology - Types of Presses and Press Accessories – Computation of capacities and tonnage requirements – Strip layout

UNIT V DIES 12

Design and development of various types of Cutting, Forming and Drawing dies – Blank development for cylindrical and non cylindrical shells – Compound , Progressive and Combination dies.

TOTAL NO. OF PERIODS : 60

References :

1. ASTME Handbook of Fixture design,1960.
2. Fundamentals of tool Design ASTME, 1984.
3. Akgoroshkin, Jigs and Fixture Handbook, Mix Publishers, Moscow, 1983 .
4. Design Data, PSG Tech, Coimbatore, 2003.
5. Design of Jigs, Fixtures and Press tools, C.Elanchezhian,T.Sunderselvan, B.Vijayaramnath, Eswar press, 2005.

BME033 COMPOSITE MATERIALS AND TECHNOLOGY 3 0 0 3

OBJECTIVES

- To understand the fundamentals of composite material strength and its mechanical behavior Understanding the analysis of fiber reinforced Laminate design for different combinations of plies with different orientations of the fiber.
- Thermo-mechanical behavior and study of residual stresses in Laminates during processing. Implementation of Classical Laminate Theory (CLT) to study and analysis for residual stresses in an isotropic layered structure such as electronic chips.

Course Outcomes:

At the end of this course, students shall be able to

CO1: Will understand the fundamentals of composite material strength and its mechanical behavior

CO2: Understanding the analysis of fiber reinforced Laminate design for different combinations of plies with different orientations of the fiber.

CO3: Thermo-mechanical behavior and study of residual stresses in Laminates during processing. Implementation of Classical Laminate Theory (CLT)

CO4: They study and analysis for residual stresses in an isotropic layered structure such as electronic chips.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COS/POS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				W			M		M			
CO2										M		
CO3			S			W						M
CO4			S							W		M
CO5												

Course Assessment Method

Direct	**Indirect**
Internal Test	Student Exit Survey
Assignments	Faculty Survey
Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I INTRODUCTION 9

Conventional materials–Limitations–Definition of composite materials–Difference between conventional and composite materials-Types of Characteristics (Dispersions, particulates, fibre)-Application.

UNIT II MARERIALS 9

Fibres-Materials-fibre reinforced plastics-Thermoset polymers-Coupling agents, fillers and additives-Metal matrix and ceramic composites-Particulate reinforced composite

UNIT III MANUFACTURING 9

Fundamentals-bag moulding-compression moulding- pultrusion-filament winding-other manufacturing process-MMC's Casting (Solid and liquids state processing)-quality inspection and non destructive testing

UNIT IV MECHANICS AND PERFORMANCE 9

Introduction to micro-mechanics-Unidirectional laminates-interlinear stresses-static mechanical properties-fatigue properties-impact properties-environmental effects-fracture mechanics and toughening mechanisms, damage prediction, failure modes.

UNIT V DESIGN OF COMPOSITES 9

Failure predictions-design considerations-joint design-codes-design examples. Optimization of laminated composites-Application of FEM for design and analysis of laminated composites.

TOTAL NO. OF PERIODS: 45

References:

1. Ronald Gibson, Principles of Composite Material Mechanics, Tata McGraw Hill, 1994.
2. Michael Hyer, Stress Analysis of Fiber- reinforced composite Materials, Tata Mcgraw Hill, 1998.