BHARATH INSTITUTE OF HIGHER EDUCTAION AND RESEARCH

CURRICULUM AND SYLLABUS

B.Tech - MECHANICAL ENGINEERING

(FULL TIME)

I – VIII SEMESTERS

SEMESTER I						
Code No.	**Category**	**Course Title**	**L**	**T**	**P**	**C**
THEORY						
BEN101	HS	English-I	3	1	0	3
BMA101	BS	Mathematics –I	3	1	0	3
BPH 101	BS	Engineering Physics – I	3	0	0	3
BCH101	BS	Engineering Chemistry – I	3	0	0	3
BCS101	ES	Fundamentals of Computing and Programming	3	0	0	3
BBA101	HS	Personality Development	1	1	0	2
BBT 102	BS	Biology for Engineers	2	0	0	2
BCE101	ES	Basic Civil Engineering	2	0	0	2
BME101	ES	Engineering Graphics-E	2	3	0	4
PRACTICAL						
BCM1L1	ES	Basic Civil and Mechanical Engineering Practices Laboratory	0	0	3	1
BPC1L1*	BS	Physics and Chemistry Laboratory	0	0	3	0
BSS1L4/ 1L5/IL6	HS	NCC/NSS/NSO (to be conducted during weekends)	0	1	2	1
*Laboratory Classes on alternate weeks for Physics and Chemistry. The Laboratory examinations will be held only in the second semester (including the first semester experiments also)						
Total No. of Contact Hours: 37 Total No. of Credits: 27						

SEMESTER II						
Code No.	**Category**	**Course Title**	**L**	**T**	**P**	**C**
THEORY						
BEN 201	HS	English-II	3	1	0	3
BMA201	BS	Mathematics- II	3	1	0	3
BPH 201	BS	Engineering Physics – II	3	0	0	3
BCH201	BS	Engineering Chemistry – II	3	0	0	3
BFR201#	HS	Foreign/Indian Language	3	0	0	3
BME202	ES	Engineering Mechanics	3	1	0	3
BEE201	ES	Basic Electrical and Electronics Engineering	2	0	0	2
PRACTICAL						
BCS2L2	ES	Computer Practices Laboratory	0	0	3	1
BEE2L1	ES	Basic Electrical and Electronics Engineering Practices	0	0	3	1
BPC2L1*	BS	Physics and Chemistry Laboratory	0	0	3/3	1
BSS2L7	HS	Yoga	0	1	2	1
# 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: 24**			

SEMESTER III						
Code No.	**Category**	**Course Title**	**L**	**T**	**P**	**C**
THEORY						
BMA301	BS	Mathematics III	3	2	0	4
BME301	PC	Kinematics of Machines	4	0	0	4
BME302	PC	Thermodynamics	4	0	0	4
BME303	PC	Mechanics of Solids	4	0	0	4
BME304	PC	Fluid Mechanics and Machinery	3	0	0	3
BME305	PC	Manufacturing Technology –I	4	2	0	3
PRACTICAL						
BME3L1	PC	Machine Drawing	2	0	2	3
BCE3L3	PC	Fluid Mechanics, Machinery and Strength of Materials Laboratory	0	0	3	2
Total No. of Contact Hours: 33		**Total No. of Credits: 27**				

SEMESTER IV						
Code No.	**Category**	**Course Title**	**L**	**T**	**P**	**C**
THEORY						
BMA401	BS	Numerical Methods	3	2	0	4
BME401	PC	Dynamics of Machines	4	0	0	4
BME402	PC	Thermal Engineering I	4	0	0	4
BME403	PC	Industrial Metallurgy	3	0	0	3
BME404	PC	Engineering Metrology and Instrumentation	3	0	0	3
BCE406	HS	Environmental Studies	3	0	0	3
PRACTICAL						
BME4L1	PC	Metrology and Metallurgy Laboratory	0	0	3	2
BME4L2	PC	Manufacturing Technology Laboratory -I	0	0	3	2
BME4L3	PR	Technical Seminar-I	0	0	2	1
Total No. of Contact Hours: 30		**Total No. of Credits: 26**				

SEMESTER V						
Code No.	**Category**	**Course Title**	**L**	**T**	**P**	**C**
THEORY						
BME501	PC	Machine Design I	3	2	0	4
BME502	PC	Thermal Engineering II	3	0	0	3
BME503	PC	Fluid Power Systems	3	0	0	3
BME504	PC	Automobile Engineering	3	0	0	3
BME505	PC	Manufacturing Technology –II	3	0	0	3
BME5E1	CE	Core Elective -I	3	0	0	3
PRACTICAL						
BME5L1	PC	Thermal Engineering Lab	0	0	3	2
BME5L2	PC	Manufacturing Technology Laboratory - II	0	0	3	2
BME5L3	PC	Instrumentation and Dynamics Laboratory	0	0	3	2
BME5C1	PR	Comprehension-I	0	0	0	1
Total No. of Contact Hours: 29			**Total No. of Credits: 26**			

SEMESTER VI						
Code No.	**Category**	**Course Title**	**L**	**T**	**P**	**C**
THEORY						
BME601	PC	Machine Design II	4	0	0	4
BME602	PC	Finite element analysis	4	0	0	4
BME603	PC	Heat and Mass Transfer	4	0	0	4
BME604	PC	CAD/CAM	3	0	0	3
BSS601	HS	Value Education and Professional Ethics	3	0	0	3
BME6E2	CE	Core Elective- II	3	0	0	3
PRACTICAL						
BME6L1	PC	Heat Transfer Laboratory	0	0	3	2
BME6L2	PC	CAD/CAM Laboratory	0	0	3	2
BME6L3	PR	Technical Seminar -II	0	0	2	1
Total No. of Contact Hours: 29			**Total No. of Credits: 26**			

SEMESTER VII						
Code No.	**Category**	**Course Title**	**L**	**T**	**P**	**C**
THEORY						
BME701	PC	Industrial Engineering	3	0	0	3
BME702	BS	Operations Research for Engineers	4	0	0	4
BME5E3	CE	Core Elective- III	3	0	0	3
BME7E4	NE	Non Major Elective- I	3	0	0	3
BME7E5	NE	Non Major Elective- II	3	0	0	3
BME7E6	OE	Open Elective- I	3	0	0	3
PRACTICAL						
BMT7L1	PC	Fluid Power Automation Lab & Microprocessor Laboratory	0	0	3	2
BME7L1	PC	Computer Aided Analysis and Simulation Laboratory	0	0	3	2
BME7P1	PR	Term Paper	0	0	4	2
Total No. of Contact Hours: 29		**Total No. of Credits: 25**				

SEMESTER VIII						
Code No.	**Category**	**Course Title**	**L**	**T**	**P**	**C**
THEORY						
BME8E7	NE	Non Major Elective –III	3	0	0	3
BME8E8	OE	Open Elective –II	3	0	0	3
PRACTICAL						
BME8P1	PR	Project work	0	0	18	9
BME8C1	PR	Comprehension-II	0	0	0	1
Total No. of Contact Hours: 24		**Total No. of Credits: 16**				

OVERALL CREDITS: 197

SUMMARY OF CURRICULUM STRUCTURE AND CREDIT & CONTACT HOUR DISTRIBUTION

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S.No.	Sub Area	Credit As per Semester								No. of Credit	% of credit
		I	II	III	IV	V	VI	VII	VIII		
1	Humanities & Social Sciences (HS)	6	7	-	3	-	3	-	-	19	09.64
2	Maths &Basic Sciences (BS)	11	10	4	4	-	-	4	-	33	16.75
3	Engineering Sciences (ES)	10	7	-		-	-	-	-	17	08.63
4	Professional Core (PC)	-	-	23	18	22	19	7	-	89	45.18
5	Core Electives (CE)	-	-	-		3	3	3	-	9	04.57
6	Non major Electives (NE)	-	-	-		-	-	6	3	9	04.57
7	Open Electives (OE)	-	-	-		-	-	3	3	6	03.05
8	Project Work, Seminar, Internship, Term Paper, etc. (PR)	-	-	-	1	1	1	2	10	15	07.61
	Total Credit	27	24	27	26	26	26	25	16	197	100%
	Total Contact Hour	37	35	33	30	29	29	29	24	246 Hrs	-

LIST OF ELECTIVES

List of Core Elective (CE) - I:

Code No.	Course Title	L	T	P	C
BME001	Advanced Internal Combustion Engines	3	0	0	3
BME002	Special Casting Process	3	0	0	3
BME003	Mechanical Vibrations	3	0	0	3
BME004	Plant layout and Material Handling	3	0	0	3

List of Core Elective (CE) - II:

Code No.	Course Title	L	T	P	C
BME005	Design of Heat Exchangers	3	0	0	3
BME006	Combustion Engineering	3	0	0	3
BME 007	Composite materials and Technology	3	0	0	3
BME008	Mechanics of Fracture	3	0	0	3

List of Core Elective (CE) - III :

Code No.	Course Title	L	T	P	C
BME009	Design for Manufacturing	3	0	0	3
BME010	Advanced Turbo Machines	3	0	0	3
BME 011	Process planning and cost Estimation	3	0	0	3
BME012	Jigs, Fixtures and Press tools	3	0	0	3

List of Non Major Elective (NE) - I :

Code No.	Course Title	L	T	P	C
BGE001	Vibration Control and Condition Monitoring	3	0	0	3
BGE002	Wind and Solar Energy	3	0	0	3
BGE003	New and Renewable Sources of Energy	3	0	0	3
BGE 004	Electronics for Mechanical systems	3	0	0	3

List of Non Major Elective (NE) - II :

Code No.	Course Title	L	T	P	C
BGE005	Industrial Robotics	3	0	0	3
BGE006	Power Plant Engineering	3	0	0	3
BGE007	Gas Dynamics and Space Propulsion	3	0	0	3
BBA008	Total Quality Management	3	0	0	3

List of Non Major Elective (NE) - III:

Code No.	Course Title	L	T	P	C
BGE009	Nuclear Engineering	3	0	0	3
BGE010	Rapid prototyping	3	0	0	3
BGE011	Computational Fluid Dynamics	3	0	0	3
BGE012	MEMS & Nanotechnology	3	0	0	3

List of Open Elective (OE) - I:

Code No.	Course Title	L	T	P	C
BBA001	Principles of Management and Organizational Behavior	3	0	0	3
BBA002	Entrepreneurship Development	3	0	0	3
BBA003	Marketing Management	3	0	0	3

List of Open Elective (OE) - II:

Code No.	Course Title	L	T	P	C
BBA004	Engineering Economics and Financial Accounting	3	0	0	3
BBA005	Energy Engineering and Management	3	0	0	3
BBA006	Indian Constitution and Society	3	0	0	3
BBA007	Engineering Economics and Cost Analysis	3	0	0	3

BEN101	ENGLISH - I	L	T	P	C
	Total Contact Hours – 60	3	1	0	3
	Prerequisite – +2 Level English				
	Course Designed by – Department of English				

OBJECTIVES

To make the students learn the basic modes of communication for fluency and attainment of confidence in speech, reading and writing.

COURSE OUTCOMES (COs)

CO1	Understand the importance of being responsible, logical, and thorough.
CO2	Respond to the situations where short reports and instructions are required.
CO3	Explain "how things work", and what to suggest when "things don't work
CO4	Develop our confidence and authority in the practical use of language.
CO5	Understand the importance of being responsible, logical, and thorough.
CO6	Able to Face interviews and competitive examinations

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	H	H	H	H	M	L	L	H	H	H	H
	CO2							L					
	CO3	H						H		H			H
	CO4	H	M				M	L	H	H			H
	CO5							L					
	CO6	H		H	H	H	H	L		H	H	M	H

3	Category	Humanities & Social Studies (HS)	Basic Sciences &Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Professional Elective (PE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
		√							
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I STRUCTURES 12

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 IITRANSCODING 12

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 IIIREPORTING **12**

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

UNIT IVFORMAL DOCUMENTATION **12**

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

UNIT VMETHODOLOGY **12**

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

TEXT BOOK

1. Department Of Humanities and Social Sciences Division, Anna University, Oxford University Press, 2013.

REFERENCES:

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. Murali Krishna and Sunitha Moishra, Communication Skills for Engineers . Pearson, New Delhi, 2011.

BMA101	**MATHEMATICS I**	**L**	**T**	**P**	**C**
	Total Contact Hours - 60	3	1	0	3
	Prerequisite – + 2 Level Mathematics				
	Course Designed by – Department of Mathematics				

OBJECTIVES

To make the students learn Mathematics in order to formulate and solve problems effectively in t respective fields of engineering.

COURSE OUTCOMES (COs)

CO1	Study the fundamentals of mathematics
CO2	Students learn multiple integral techniques
CO3	Students gain knowledge in application of variables
CO4	Find area and volume based on a function with one or more variables.
CO5	Apply matrix operations to solve relevant real life problems in engineering.
CO6	Formulate a mathematical model for three dimensional objects and solve

	Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low												
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H											
	CO2			M		H							
	CO3		H				M						
	CO4								L				
	CO5							H			L		
	CO6											L	
3	Category	Humanities & Social Studies (HS)		Basic Sciences &Maths (BS)	Engg Sciences (ES)		Professional Core (PC)		Professional Elective (PE)	Non-Major Elective (NE)	Open Elective (OE)		Project/ Seminar/ Internship (PR)
				√									
4	Approval	37th Meeting of Academic Council, May 2015											

UNIT-1 MATRICES 12

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 12

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 12

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

UNIT 1V FUNCTIONS OF SEVERAL VARIABLES 12

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 12

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.

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", 40th 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", 7thEdition, Pearson Education, 2007.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th Edition, John Wiley 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.

BPH101	**ENGINEERING PHYSICS I**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite – +2 level Physics				
	Course Designed by – Department of Physics				

OBJECTIVES:

To enhance the fundamental knowledge in Physics and its applications relevant to various stream Engineering and Technology

COURSE OUTCOMES (COs)

CO1	Understand the Principles and Laws of Physics
CO2	To understand the impact of Crystal Physics
CO3	Learn the Properties of Elasticity and Heat transfer.
CO4	Acquire Knowledge on Quantum Physics.
CO5	Understand the concepts on Laser & Ultrasonic's and its Applications
CO6	Understand the Principle of Laser and its Applications in Engineering and Medicine.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	A	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H						M			H		
	CO2		L	H		M				M		L	H
	CO3												
	CO4	H		M	L						L		M
	CO5		L	L								L	L
	CO6												

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Professional Elective (PE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
			√						
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I CRYSTAL PHYSICS 9

Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – Diamond and graphite structures (qualitative treatment)- Crystal growth techniques –solution, melt (Bridgman and Czochralski) and vapour growth techniques (qualitative)

UNIT II PROPERTIES OF MATTER AND THERMAL PHYSICS 9

Elasticity-Hooke's law - Relationship between three modulii of elasticity (qualitative) – stress - strain diagram – Poisson's ratio –Factors affecting elasticity –Bending moment – Depression of a cantilever –Young's modulus by uniform bending- I-shaped girders Modes of heat transfer- thermal conductivity- Newton's law of cooling - Linear heat flow – Lee's disc method – Radial heat flow – Rubber tube method – conduction through compound media (series and parallel).

UNIT III QUANTUM PHYSICS 9

Black body radiation – Planck's theory (derivation) – Deduction of Wien's displacement law and Rayleigh – Jeans' Law from Planck's theory – Compton effect. Theory and experimental verification – Properties of Matter waves – G.P Thomson experiment-Schrödinger's wave equation – Time independent and time dependent equations – Physical significance of wave function – Particle in a one dimensional box - Electron microscope - Scanning electron microscope - Transmission electron microscope.

UNIT IV ACOUSTICS AND ULTRASONICS 9

Classification of Sound- decibel- Weber–Fechner law – Sabine's formula- derivation using growth and decay method – Absorption Coefficient and its determination –factors affecting acoustics of buildings and their remedies. Production of ultrasonics by magnetostriction and piezoelectric methods - acoustic grating -Non Destructive Testing – pulse echo system through transmission and reflection modes - A,B and C – scan displays, Medical applications – Sonogram.

UNIT V PHOTONICS AND FIBRE OPTICS 9

Spontaneous and stimulated emission- Population inversion –Einstein's A and B coefficients - derivation. Types of lasers – Nd:YAG, CO2, Semiconductor lasers (homo junction & hetero junction)- Industrial and Medical Applications. Principle and propagation of light in optical fibres – Numerical aperture and Acceptance angle - Types of optical fibres (material, refractive index, mode) – attenuation, dispersion, bending - Fibre Optical Communication system (Block diagram) - Active and passive fibre sensors- Endoscope.

TEXT BOOKS:

1. Jayaraman D Engineering Physics I. Global Publishing House, 2014.
2. Arumugam M. Engineering Physics. Anuradha publishers, 2010.
3. Gaur R.K. and Gupta S.L. Engineering Physics. Dhanpat Rai Publishers, 2009.
4. Mani Naidu S. Engineering Physics, Second Edition, PEARSON Publishing, 2011.

REFERENCES:

1. Searls and Zemansky. University Physics, 2009
2. Marikani A. Engineering Physics. PHI Learning Pvt., India, 2009.
3. Palanisamy P.K. Engineering Physics. SCITECH Publications, 2011.
4. http://ocw.mit.edu/courses/find-by-topic
5. http://nptel.ac.in/course.php?disciplineId=122
6. https://en.wikipedia.org/wiki/Engineering_physics

BCH101	ENGINEERING CHEMISTRY - I	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – +2 Level Chemistry				
	Course Designed by – Department of Chemistry				

OBJECTIVES

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

COURSE OUTCOMES (COs)

CO1	Understand the principles of water characterization and treatment for portable and indus purposes.
CO2	To impart knowledge on the essential aspects of Principles of polymer chemistry engineering applications of polymers
CO3	Having a sound knowledge in the Field of the Conventional and non-Conventional energy
CO4	To impart knowledge on the essential aspects of electrochemical cells, emf and application EMF measurements
CO5	To make the students understand the Principles of corrosion and corrosion control .
CO6	To impart knowledge about the Conventional and non-conventional energy sources and en storage devices

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	J	k	l
2	CO1	H						H					
	CO2		L	H		M							
	CO3		M		H								
	CO4	H		M	L			H					
	CO5		L	L									
	CO6	H						H					

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Professional Elective (PE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
			√						
4	Approval	37th Meeting of Academic Council, May 2015							

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 polymerization - types of polymerization– Addition polymerization and Condensation polymerization – Mechanism of Polymerization - 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) Conduct metric 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 control – sacrificial anode and impressed cathodic current methods – Protective coatings :Paints– constituents of the paint and their functions Metallic coatings – electroplating of Gold and electro less 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

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.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).
3. http://ocw.mit.edu/courses/find-by-topic
4. http://nptel.ac.in/course.php?disciplineId=122
5. https://en.wikipedia.org/wiki/Electrochemistry

BCS101	**FUNDAMENTALS OF COMPUTING AND PROGRAMMING**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – +2 level Physics				
	Course Designed by – Department of Physics				

OBJECTIVES

Students will understand the basics of computers and solve computer oriented problems using various computing tools.

COURSE OUTCOMES (COs)

CO1	Learn the fundamental principles in computing.
CO2	Learn to write simple programs using computer language
CO3	To enable the student to learn the major components of a computer system.
CO4	Computing problems
CO5	To learn to use office automation tools.
CO6	To interpret and relate programs

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	J	k	l
2	CO1	H						H					
	CO2		L	H		M							
	CO3		M		H								
	CO4	H		M	L			H					
	CO5		L	L									
	CO6	H						H					

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Professional Elective (PE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
			√						
4	Approval	37th Meeting of Academic Council, May 2015							

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

Arrays - Handling of Character Strings - Pointers – Structures-Union -Functions – Recursion-Call by value and Call by reference.

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.

TEXT BOOKS:

1. Ashok, N.Kamthane,"Computer Programming", Pearson Education (2012).
2. Anita Goel and Ajay Mittal,"Computer Fundamentals and Programming in C", Dorling V Kindersley (India Pvt Ltd).,Pearson Education in South Asia,(2011).
3. Yashavant P. Kanetkar, "Let us C",13th Edition,BPB Publications(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. Pradip Dey, Manas Ghosh, Fundamentals of Computing and Programming in 'C' First Edition, Oxford University Press(2009).
4. The C++ Programming Language , 4th Edition, Bjarne Stroustrop, Addison-Wesley Publishing Company (2013).

BBA101	PERSONALITY DEVELOPMENT	L	T	P	C
	Total Contact Hours - 30	1	1	0	2
	Prerequisite – +2 Level Knowledge				
	Course Designed by – Department of Management Studies				

OBJECTIVES

To make students groom their personality and prove themselves as good Samaritans of the society.

COURSE OUTCOMES (COs)

CO1	Individual or in-group class presentations pertaining to the applications of concepts, theorie issues in human development..
CO2	Scores obtained from essay and or objective tests.
CO3	Attendance, classroom participation, small group interactions.
CO4	Research and write about relevant topics.
CO5	Design and complete a research project that can take the form of a developmental interview observation or assessment through service learning.
CO6	Develop and maintain a Reflection

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	J	k	l
2	CO1	L		H				M					
	CO2		H	H				M					
	CO3							M	H				
	CO4									H	H		
	CO5							M			H	H	
	CO6							M					L

3	Category	Humanities & Social Studies (HS)	Basic Sciences &Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Professional Elective (PE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
		√							
4	Approval	37th Meeting of Academic Council, May 2015							

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 6

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.

TEXT BOOKS:

1. Hurlock, E.B (2006). Personality Development, 28th Reprint. New Delhi: Tata McGraw Hill.
2. Stephen P. Robbins and Timothy A. Judge (2014), Organizational Behavior 16th 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
	Total Contact Hours – 30	2	0	0	2
	Prerequisite – Basic Science				
	Course Designed by – Department of Industrial Bio Technology				

OBJECTIVES

Gain vivid knowledge in the fundamentals and uses of biology, human system and plant system**.**

COURSE OUTCOMES (COs)	
CO1	Graduates within the first five years will be able to grasp and apply biological engineering principles, procedures needed to solve real-world problems.
CO2	To understand the fundamentals of living things, their classification, cell structure and biochemical constituents
CO3	To apply the concept of plant, animal and microbial systems and growth in real life situations
CO4	To comprehend genetics and the immune system
CO5	To know the cause, symptoms, diagnosis and treatment of common diseases
CO6	To give a basic knowledge of the applications of biological systems in relevant industries

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H						M					
	CO2		H							H			
	CO3			H							M		
	CO4										H		
	CO5												
	CO6						H						M

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Professional Elective (PE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
			√						

4	Approval	37th Meeting of Academic Council, May 2015

UNIT I INTRODUCTION TO LIFE 9

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 9

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 9

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 9

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

UNIT V BIOLOGY AND ITS INDUSTRIAL APPLICATION 9

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.

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	**BASIC CIVIL ENGINEERING**	**L**	**T**	**P**	**C**
	Total Contact Hours – 30	2	0	0	2
	Prerequisite – +2 Level Maths & Physical Science				
	Course Designed by – Department of Civil Engineering				

OBJECTIVES: Understand the basic concepts of civil engineering.

COURSE OUTCOMES (COs)

CO1	Will gain knowledge in Design, concept preparation
CO2	Loading calculation
CO3	Structural component design
CO4	Drawing and chart preparation
CO5	Will understand the components of buildings.
CO6	Will learn the engineering aspects to dams , water supply and sewage disposal.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	H			H		L					
	CO2					H	H						
	CO3							H	L				
	CO4									L			
	CO5										H	L	
	CO6												

3	Category	Humanities & Social	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Professional Elective	Non-Major Elective	Open Elective (OE)	Project/ Seminar/ Internship (PR)
				√					
4	Approval	37th Meeting of Academic Council, May 2015							

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 III FOUNDATION 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)

TEXT BOOKS:

1. Raju.K.V.B, Ravichandran .P.T, "Basics of Civil Engineering", Ayyappa Publications, Chennai, 2012.
2. SeetharamanS., "Basic Civil Engineering", Anuradha Agencies, (1st ed. 2005).
3. Dr.M.SPalanisamy, "Basic Civil Engineering" (3rded. 2000), TUG Publishers, New Delhi/Tata McGrawHill Publication Co., New Delhi

REFERENCE BOOKS:

1. Rangwala.S.C, "Engineering Materials", 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
	Total Contact Hours - 60	2	3	0	4
	Prerequisite – +2 Level Maths & Physical Science				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

To understand techniques of drawings in various fields of engineering

COURSE OUTCOMES (COs)

CO1	To know about different types of lines & use of different types of pencils in an Engineering Drawing
CO2	To know how to represents letters & numbers in drawing sheet
CO3	To know about different types of projection
CO4	To know projection of points ,straight lines, solids etc.
CO5	To know development of different types of surfaces.
CO6	To know about isometric projection.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	J	k	l
2	CO1	H											H
	CO2	M	H										M
	CO3			L									M
	CO4						L		H	H			L
	CO5			L						H			L
	CO6			L							H		L

3	Category	Humanities & Social	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Professional Elective	Non-Major Elective	Open Elective (OE)	Project/ Seminar/ Internship (PR)
				√					

4	Approval	37th Meeting of Academic Council, May 2015

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, tetrahedron 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.

UNITIII ORTHOGRAPHIC PROJECTIONS, ISOMETRIC PROJECTIONS & FREEHANDSKETCHING 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

UNITIVPROJECTION 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 VPERSPECTIVE 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.

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. Prabhu Raja, "Engineering Graphics", New Age International Private limited,2008.
3. Luzzader, Warren.J., and Duff, John.M.,, "Fundamentals 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	BASIC CIVIL & MECHANICAL ENGINEERING PRACTICES LABORATORY	L	T	P	C
	Total Contact Hours - 30	0	0	3	1
	Prerequisite – Basic Civil and Mechanical Engineering				
	Course Designed by – Department of Mechanical Engineering& Civil Engineering				

OBJECTIVES

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

COURSE OUTCOMES (COs)

CO1	Learn Basic concepts
CO2	Students will get exposure regarding pipe connection for pumps & turbines and to study the joint used in roofs, doors, windows and furniture's.
CO3	Students will get exposure regarding smithy, foundry operations and in latest welding operations such as TIG, MIG, CO2, spot welding etc.,
CO4	Students will get hands on experience on basic welding techniques, machining and sheet metal works.
CO5	Students will get hands on experience on basic machining techniques
CO6	Students will get hands on experience on basic sheet metal techniques

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	J	k	l
2	CO1	H	L										
	CO2				H								
	CO3					H	L	L					
	CO4		H				M		L			H	
	CO5		H				M		L			H	
	CO6		H				M		L			H	

3	Category	Humanities	Basic Sci	Engg Sci	Profession 1	Profession	Non-M	Open El	Project/Te
				√					

4	Approval	37th Meeting of Academic Council, May 2015

LIST OF EXPERIMENTS

I. CIVILENGINEERINGPRACTICE

Buildings:

a) Study of plumbing and carpentry components of residential and industrial buildings. Safetyaspects.

Plumbing Works:

a) Study of pipeline joints, its location and functions :valves, taps, couplings, unions, reducers, elbows in house hold fittings.

b) Study of pipe connections requirements for pumps and turbines.

c) Preparation of plumbing line sketches for water supply and sewage works.

d)Hands-on-exercise: Basic pipe connection of PVC pipes & G.I.Pipes–Mixed pipe material connection–Pipe connections with different joining components.

e) Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Hand tools and Power tools:

a) Study of the joints in roofs, doors, windows and furniture.

b) Hands-on-exercise: Wood work, joints by sawing, planning and cutting.

c) Preparation of half joints, Mortise and Tenon joints.

II MECHANICALENGINEERINGPRACTICE

Welding:

a) Preparation of butt joints, lap joints and tee joints by arc welding

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
e) Preparation of butt joints ,lap joints and tee joints by arc welding

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:

a) Moulding operations like mould preparation for gear and step cone pulley etc

Fitting:

a) Fitting Exercises–Preparation of square fitting and vee–fitting models.

Demonstration:

a) Smithyoperations,upsetting,swaging,settingdownandbending.Example–Exercise–Productionofhexagonalheaded 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 Publishing 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", SreeSai Publication, (2002).
5. P. Kannaiah& K.L. Narayana, "Manual on Workshop Practice", Scitech Publication, (1999).

BPC 1L1	**PHYSICS AND CHEMISTRY LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	0	0	3	0
	Prerequisite – Physics and Chemistry				
	Course Designed by – Department of Physics & Chemistry				

OBJECTIVES: To impart knowledge to the students in practical physics and chemistry

COURSE OUTCOMES (COs)

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 practically understand the chemical reactions.
CO5	Students will Study the magnetic hysteresis and energy product
CO6	Students understand the Determination of Band gap of a semiconductor

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	M	H	M			L		L	L	M	H	M
	CO2		H	M			L		L	L		H	
	CO3		H	M			L		L			H	
	CO4	M	H	M			L		L	L	M	H	M
	CO6		H				L		L	H		H	

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Term Paper/ Seminar/ Internship (PR)
			√						
4	Approval	37th Meeting of Academic Council, May 2015							

I -LIST OF EXPERIMENTS – PHYSICS

1. Determination of Wavelength, and particle size using Laser
2. Determination of acceptance angle in an optical fiber.
3. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer.
4. Determination of wavelength of mercury spectrum – spectrometer grating
5. Determination of thermal conductivity of a bad conductor – Lee‟s Disc method.
6. Determination of Young‟s modulus by Non uniform bending method
7. Determination of specific resistance of a given coil of wire – Carey Foster‟s Bridge
8. Determination of Young‟s modulus by uniform bending method

9. Determination of band gap of a semiconductor
10. Determination of Coefficient of viscosity of a liquid –Poiseuille‟s method
11. Determination of Dispersive power of a prism - Spectrometer
12. Determination of thickness of a thin wire – Air wedge method
13. Determination of Rigidity modulus – Torsion pendulum

II-LIST OF EXPERIMENTS – CHEMISTRY

1. Estimation of hardness of Water by EDTA
2. Estimation of Copper in brass by EDTA
3. Determination of DO in water (Winkler'smethod)
4. Estimation of Chloride in Water sample (Argento metry)
5. Estimation of alkalinity of Water sample
6. Determination of molecular weight
7. Conduct metric titration (Simple acid base)
8. Conduct metric titration (Mixture of weak and strong acids)
9. Conduct metric titration using $BaCl_2$vs Na_2SO_4
10. Potentiometric Titration (Fe^{2+} / $KMnO_4$ or $K_2Cr_2O_7$)
11. pH titration (acid & base)
12. Determination of water of crystallization of a crystalline salt (Copper Sulphate)
13. Estimation of Ferric iron by spectrophotometer.

BSS 1L5 NSS PRACTICAL L T P C

0 1 2 1

OBJECTIVES

1. Understand the community in which they work and their relation
2. Identify the needs and problems of the community and involve them in problem-solving
3. Develop capacity to meet emergencies and natural disasters
4. Practice national integration and social harmony and
5. Utilize their knowledge in finding practical solutions to individual and community problems.

1. Regular Activities Programme

1) Traffic regulation
2) Working with Police Commissioner's Office
3) Working with Corporation of Chennai
4) Working with Health Department
5) Blind assistance
6) Garments collection
7) Non-formal education
8)Environmental Education, Awareness and Training (EEAT)
9) Blood donation

2.Special camp Programme

A) Legal awareness
B) Health awareness
C) First-aid
D) Career guidance
E) Leadership training - cum - Cultural Programme
F) Globalization and its Economic Social Political and Cultural impacts.

REFERENCE BOOKS:

1. National Service Scheme Manual, Government of India.
2. Training Programme on National Programme scheme, TISS.
3. Orientation Courses for N.S.S. Programme officers, TISS.
4. Case material as Training Aid for field workers, Gurmeet Hans.
5. Social service opportunities in Hospitals, Kapil K.Krishan,TISS.
6. Social Problems in India, Ram Ahuja.

BEN 201	ENGLISH II	L	T	P	C
	Total Contact Hours – 60	3	1	0	3
	Prerequisite – English I				
	Course Designed by – Department of English				

OBJECTIVES

Students will be able to actively participate in group discussions. Students will have Telephonic Sk Giving Directions and Information Transfer

COURSE OUTCOMES (COs)

CO1	To make the students aware to different kinds of Learner-friendly modes of language to a variet self- instructional learning (Computer based)
CO2	To make students comprehend the habit of intelligent Reading as well as Computer- b competitive exams glob
CO3	To achieve a reasonably good level of competency in Report Writing.
CO4	To make the students aware to different kinds of Learner-friendly modes of language to a variet self- instructional learning (Computer based)
CO5	To achieve a reasonably good level of competency in group discussions
CO6	To achieve a reasonably good level of competency in public speaking

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	J	k	l
2	CO1	M	L	H	L	M			H		M	L	
	CO2			H	L				H		M	L	
	CO3			H	L	M			H		H	L	
	CO4			H	L	M			H		M	L	
	CO5			H	L	M			H		M	L	
	CO6			H	L	M			H		M	L	

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Professional Elective (PE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
		√							
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I ORIENTATION 12

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 12

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 12

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 12

Definitions - Compound nouns - Abbreviations and acronyms – (a) 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 12

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.

TEXT BOOK:

1. Meenakshi Raman, Sangeetha Sharma , 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	**MATHEMATICS – II**	**L**	**T**	**P**	**C**
	Total Contact Hours - 60	3	1	0	3
	Prerequisite – Mathematics I				
	Course Designed by – Department of Mathematics				
OBJECTIVES Ability to apply these principles of mathematics in projects and research works.					
COURSE OUTCOMES (COs)					
CO1	Student shall be able to Solve differential equations, simultaneous linear equations, and some spe types of linear equations related to engineering.				
CO2	Relate the use of mathematics in applications of various fields namely fluid flow, heat flow, s mechanics, electrostatics, etc.				
CO3	Ability to test hypothesis				
CO4	Find intensity of degree of relationship between two variables and also bring out regression equatio				
CO5	Understand to solve matrix problems related to real life problems.				
CO6	Formulate mathematical models				

		Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low											
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H		L									
	CO2		H				H		L	L		M	
	CO3		H				H		L	L		M	
	CO4					M						M	
	CO5										M	M	
	CO6										M		
3	Category	Humanities & Social		Basic Sciences & Math		Engg Sciences (ES)	Professional Core (PC)		Professional Elective	Non-Major Elective	Open Elective (OE)		Project/ Seminar/ Internship (PR)
				√									
4	Approval	37th Meeting of Academic Council, May 2015											

UNIT I ORDINARY DIFFERENTIAL EQUATION 12

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 II VECTOR CALCULUS 12

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 12

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 12

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 poles on boundaries).

UNIT V STATISTICS 12

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

TEXT BOOK:

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", 3rdEdition, Laxmi Publications (P) Lltd, 2008 .
3. Grewal .B/S "Higher Engineering Mathematics", 40thEditon, Khanna Publications, Delhi, 2007

REFERENCES :

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

BPH201	ENGINEERING PHYSICS -II	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – ENGINEERING PHYSICS -I				
	Course Designed by – Department of Physics				

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 (COs)

CO1	Understand about properties and advancements of conducting materials.
CO2	Understand 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 modern materials in technical uses.
CO6	Learn new engineering materials and its characteristics

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H											
	CO2		L	H		M							
	CO3		M		H								
	CO4	H		M	L								
	CO5		L	L									
	CO6	H											

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Professional Elective (PE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
			√						
4	Approval		37th Meeting of Academic Council, May 2015						

UNIT I CONDUCTING MATERIALS 9

Conductors – classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann – Franz law – Lorentz number – Draw backs of classical theory – Quantum theory – Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals.

UNIT II SEMICONDUCTING MATERIALS 9

Intrinsic semiconductor – carrier concentration derivation Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – compound semiconductors -direct and indirect band gap- derivation of carrier concentration in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration — Hall effect –Determination of Hall coefficient – Applications.

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS 9

Origin of magnetic moment – Bohr magneton – comparison of Dia, Para and Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – antiferromagnetic materials – Ferrites and its applications Superconductivity : properties – Type I and Type II superconductors – BCS theory of superconductivity(Qualitative) - High Tc superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.

UNIT IV DIELECTRIC MATERIALS 9

Electrical susceptibility – dielectric constant – electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarisation – internal field – Claussius – Mosotti relation (derivation) – dielectric loss – dielectric breakdown – uses of dielectric materials (capacitor and transformer) – ferroelectricity and applications.

UNIT V ADVANCED ENGINEERING MATERIALS 9

Metallic glasses: preparation, properties and applications. Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, application, Nanomaterials– Preparation -pulsed laser deposition – chemical vapour deposition – Applications – NLO materials –Birefringence- optical Kerr effect – Classification of Biomaterials and its applications.

TEXT BOOKS:

1. Jayaraman D Engineering Physics II. Global Publishing House, 2014.
2. Palanisamy P.K. Materials Science. SCITECH Publishers, 2011.
3. Senthilkumar G. Engineering Physics II. VRB Publishers, 2011.

REFERENCES:

1.Arumugam M., Materials Science. Anuradha publishers, 2010
2. Pillai S.O., Solid State Physics. New Age International(P) Ltd., publishers, 2009
3. Marikani A. Engineering Physics. PHI Learning Pvt., India, 2009
4 http://ocw.mit.edu/courses/find-by-topic
5 http://nptel.ac.in/course.php?disciplineId=122
6 https://en.wikipedia.org/wiki/Engineering_physics

BCH 201	**ENGINEERING CHEMISTRY-II**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – ENGINEERING CHEMISTRY –I				
	Course Designed by – Department of Chemistry				

OBJECTIVES

To impart a sound knowledge on the principles of chemistry involving application oriented to required for all engineering branches.

COURSE OUTCOMES (COs)

CO1	Students will understand the concepts and further industrial applications of surface chemistry
CO2	To impart knowledge about the Industrial importance of Phase rule and alloys
CO3	To make the students to be conversant with Analytical techniques of chemistry and their importanc
CO4	To have an idea and knowledge about the Chemistry of Fuels and
CO5	Understanding of engineering materials
CO6	All about bonding and molecular structures

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	H	L		H		H				M	
	CO2		H			H		H					
	CO3	H		L		H		H				M	
	CO4			L		H		H					
	CO5			L		H		H					
	CO6			L		H		H		H		M	

3	Category	Humanities & Social	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Professional Elective	Non-Major Elective (NE)	Open Elective	Project/ Seminar/ Internship (PR)
			√						

4	Approval	37th Meeting of Academic Council, May 2015

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 - nit riding . 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: Refractory's **–** classification **–** acidic, basic and neutral refractory's **–** properties (refractoriness, refractoriness under load, dimensional stability, porosity, thermal spalling) Manufacture of Refractory's: 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, oiliness) Solid lubricants **–** graphite and molybdenum sulphide

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).
3. http://ocw.mit.edu/courses/find-by-topic
4. http://nptel.ac.in/course.php?disciplineId=122
5. https://en.wikipedia.org/wiki/Spectroscopy

BFR 201	FRENCH	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – +2 Level English				
	Course Designed by – Department of English				

OBJECTIVES

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

COURSE OUTCOMES (COs)

CO1	Introduce the basics of the language to beginners
CO2	Understand a dialogue and dialogue presentation
CO3	To develop their knowledge as well as their communicative skills so as to be able to respond in sir everyday contexts.
CO4	Synchronies I includes documents which initiate the learners to another world, another culture and w acclimatize them to the authentic use of the French language through the exploitation of written iconographic documents. The Indian context has been used.
CO5	Grammatical and lexical notions as well as activities required for communication are learnt by the studen
CO6	Interpreting skills and confidence in the language.
CO6	Interpreting skills and confidence in the language.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	L										
	CO2			H	L				H	H	M	L	L
	CO3			H	L				H	H	M	L	L
	CO4			H					H	H	M	L	L
	CO5			H	L				H	H	M		L
	CO6			H					H	H	M		L

3	Category	Humanities & Social Studies	Basic Sciences	Engg Sciences (ES)	Professional Core (PC)	Professional Elective (PE)	Non-Major Elective	Open Elective (OE)	Project/ Seminar/ Internship (PR)
		√							
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I INTRODUCTION 8

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 GRAMMAR 8

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 CONVERSATION **8**

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 PROPOSAL WRITING **7**

At the beach: Savoir faire: proposing an outing, accepting/ refusing the proposal - Grammar: singular & plural, indefinite pronoun, demonstrative adjectives, negation, irregular verbs

UNIT V FORMAL LETTERS **7**

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

UNIT VI REGULAR & IRREGULAR VERBS **7**

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

REFERENCES:

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

BGM 201	**GERMAN**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisite +2 Level English				
	Course Designed by – Department of English				

OBJECTIVES

At the end of this course, students shall be able to obtain good knowledge of the language, to read, write speak German, whereby the emphasis is laid on speech.

COURSE OUTCOMES (COs)

CO1	Will have a basic knowledge of the language
CO2	Will acquire reading and writing skills.
CO3	Will develop basic conversational skills.
CO4	Will understand German lifestyle
CO5	Will gain confidence to survive in a global environment
CO6	Will have attained to survive and adopt change in a foreign culture .

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	L										
	CO2			H	L				H	H	M	L	L
	CO3			H	L				H	H	M	L	L

	CO4			H					H	H	M	L	L
	CO5			H	L				H	H	M		L
	CO6			H					H	H	M		L
3	Category	Humanities & Social Studies (HS)		Basic Sciences (BS)		Engg Sciences (ES)	Professional Core (PC)		Professional Elective (PE)	Non-Major Elective (NE)	Open Elective (OE)		Project/ Seminar/ Internship (PR)
		√											
4	Approval	37th Meeting of Academic Council, May 2015											

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 IPRONOUNCIATION **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 IISELF INTRODUCTION **9**

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

UNIT IIITRAINING **9**

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

UNIT IVORAL **9**

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

UNIT VNARRATION **9**

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

RESOURCES:

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

BJP 201	JAPANESE	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – +2 Level English				
	Course Designed by – Department of English				

OBJECTIVES

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 OUTCOMES (COs)

CO1	Will have a basic knowledge of the language
CO2	Will acquire reading and writing skills.
CO3	Will develop basic conversational skills.
CO4	Will understand Japanese lifestyle
CO5	Will gain confidence to survive in a global environment
CO6	Will have attained to survive and adopt change in a foreign culture .

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	L										
	CO2			H	L				H	H	M	L	L
	CO3			H	L				H	H	M	L	L
	CO4			H					H	H	M	L	L
	CO5			H	L				H	H	M		L
	CO6			H					H	H	M		L

3	Category	Humanities & Social	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Professional Elective	Non-Major Elective	Open Elective (OE)	Project/ Seminar/ Internship (PR)
		√							
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT ICULTURAL HERITAGE **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 IIUSAGE **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 IIIORAL **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 IVART AND CULTURE **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 VDRILLS AND PRACTICE **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

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 beginners through advanced course, Living Language, 2012

BKR 201	**KOREAN**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – +2 Level English				
	Course Designed by – Department of English				

OBJECTIVES

To have a basic knowledge of Korean language, Korean culture and heritage
To impart knowledge on Korean lifestyle and heritage.

COURSE OUTCOMES (COs)

CO1	Will have a basic knowledge of the language
CO2	Will acquire reading and writing skills.
CO3	Will develop basic conversational skills.
CO4	Will understand Korean lifestyle
CO5	Will gain confidence to survive in a global environment
CO6	Will have attained to survive and adopt change in a foreign culture .

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	L										
	CO2			H	L				H	H	M	L	L
	CO3			H	L				H	H	M	L	L
	CO4			H					H	H	M	L	L
	CO5			H	L				H	H	M		L
	CO6			H					H	H	M		L

3	Category	Humanities & Social	Basic Sciences & Maths	Engg Sciences (ES)	Professional Core (PC)	Professional Elective	Non-Major Elective	Open Elective (OE)	Project/ Seminar/ Internship (PR)
		√							
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT IPLANNING **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 IIMODIFIERS **9**

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

UNIT IIIPLACING ORDERS **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 IVDESCRIPTIONS **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 VGRAMMAR **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)

COURSE MATERIAL:

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

BCN 201	CHINESE	L	T	P	C
	Total Contact Hours - 60	3	0	0	3
	Prerequisite – +2 Level English				
	Course Designed by – Department of English				

OBJECTIVES

To have a basic knowledge of Chinese language, Chinese culture and heritage
To impart knowledge on Chinese lifestyle and heritage.

COURSE OUTCOMES (COs)

CO1	Will have a basic knowledge of the language
CO2	Will acquire reading and writing skills.
CO3	Will develop basic conversational skills.
CO4	Will understand Chinese lifestyle
CO5	Will gain confidence to survive in a global environment
CO6	Will have attained to survive and adopt change in a foreign culture

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	L										
	CO2			H	L				H	H	M	L	L
	CO3			H	L				H	H	M	L	L
	CO4			H					H	H	M	L	L
	CO5			H	L				H	H	M		L
	CO6			H					H	H	M		L

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Professional Elective (PE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
		√							
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I RISE OF DIALECTS 9

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

UNIT IIVARIETIES 9

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

UNIT III CHARACTERS 9

Chinese characters, Homophones, Phonology

UNIT IVTRANSCRIPTIONS **9**

Tones, Phonetic transcriptions, Romanization, Other phonetic transcriptions

UNIT VGRAMMAR **9**

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

REFERENCES:

1. Hannas, William C. (1997), Asia's Orthographic Dilemma, University of Hawaii Press, ISBNHYPERLINK "http://en.wikipedia.org/wiki/Special:BookSources/978-0-8248-1892-0" 978-0-8248- 1892-0.
2. 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.
3. Ramsey, S. Robert (1987), The Languages of China, Princeton University Press, ISBNHYPERLINK "http://en.wikipedia.org/wiki/Special:BookSources/978-0-691-01468-5" 978-0-691-01468-5.
4. Schuessler, Axel (2007), ABC Etymological Dictionary of Old Chinese, Honolulu: University of Hawaii Press, ISBNHYPERLINK "http://en.wikipedia.org/wiki/Special:BookSources/978-0-8248-2975-9"978-0-8248-2975-9.
5. R. L. G. " Language borrowing Why so little Chinese in English?" The Economist. June 6, 2013.

BME 202	ENGINEERING MECHANICS	L	T	P	C
	Total Contact Hours – 60	3	1	0	3
	Prerequisite – Engineering Mathematics I , II, Engg. Physics				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES: To understand the concept of basic engineering mechanism

COURSE OUTCOMES (COs)

CO1	Students will understand the concepts of engineering mechanics
CO2	Students will understand the vectorial representation of forces and moments
CO3	Students will gain knowledge regarding center of gravity and moment of inertia and apply them for practical problems.
CO4	Students will gain knowledge regarding various types of forces and reactions and tom draw free body diagram to quicker solutions for complicated problems.
CO5	Student will gain knowledge in solving problems involving work and energy
CO6	Student will gain knowledge on friction on equilibrium and its application.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	H	L	H		H		L		H	H	
	CO2						H	H	L				
	CO3						H	H	L		M		
	CO4						H	H	L		M		
	CO5						H	H	L		M		

	CO6						H		H		L			M					
3	Category	Humanities & Social		Basic Sciences & Maths		Engg Sciences (ES)	Professional Core (PC)		Professional Elective		Non-Major Elective		Open Elective (OE)		Project/ Seminar/ Internship (PR)				
					√														
4	Approval	37th Meeting of Academic Council, May 2015																	

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 12

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.

UNITIII PROPERTIES OF SURFACES AND SOLIDS 12

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.

UNITIV FRICTION 12

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 12

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**	**L**	**T**	**P**	**C**
	Total Contact Hours - 30	2	0	0	2
	Prerequisite – Engineering Mathematics, Engineering Physics-I & II				
	Course Designed by – Department of Electrical & Electronics Engineering				

OBJECTIVES: To understand the laws of electrical engineering.

COURSE OUTCOMES (COs)

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.
CO6	Students will acquire knowledge in using the concepts in the field of electrical engg. projects and research.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	M	H	M			L		L	L			
	CO2		H	M			L		L	L			
	CO3		H	M			L		L				
	CO4	M	H	M			L		L	L			
	CO5	M	H	M			L		L				
	CO6		H				L		L	H			

3	Category	Humanities & Social	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Professional Elective	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
				√					

4	Approval	37th Meeting of Academic Council, May 2015

UNIT I ELECTRIC CIRCUITS 6

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 –Thevenin'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 MEASUREMENT 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 Applications **–** HWR, FWR **–**Zener Diode **–** BJT (CB, CE, CC) configuration & Characteristics.

UNIT V DIGITAL ELECTRONICS 6

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

TEXT BOOKS:

1. N.Mittal "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. McGrawHill Book Compay, 2nd Edition, 1983.
2. Hyatt W.H and Kemmerlay J.E. "Engineering Circuit Analysis", McGraw Hill International Editions, 1993.
3. D. P. Kothari and I. J. Nagrath" Electric Machines"Tata McGraw-Hill Education, 2004
4. Millman and Halkias, "Integrated Electronics", Tata McGraw Hill Edition, 2004.

BCS 2L2	COMPUTER PRACTICES LABORATORY	L	T	P	C
	Total Contact Hours - 45	0	0	3	1
	Prerequisite – Fundamentals of Computer				
	Course Designed by – Department of Computer Science &Engineering				

OBJECTIVES: To impart basic computer knowledge

COURSE OUTCOMES (COs)

CO1	Demonstrate major algorithms and data
CO2	Implementation of array operations
CO3	Implementation of binary tree.
CO4	Implementation of linked list
CO5	Students will able to do analyse data using spread sheet
CO6	Student will able to understand the basics of C programming.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	H	L	H		H		L		H	H	H
	CO2						H	H	L				
	CO3						H	H	L		M		
	CO4						H	H	L		M		
	CO5						H	H	L		M		
	CO6						H	H	L		M		

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Professional Elective (PE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
				√					
4	Approval	37th Meeting of Academic Council, May 2015							

A) WORD PROCESSING **6**

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

B) SPREAD SHEET **9**

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* **15**

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

D) SIMPLE C++PROGRAMMING **15**

-Classes and Objects
-Constructor and Destructor

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

BEE2L1	**BASIC ELECTRICAL AND ELECTRONIC ENGINEERING PRACTICES LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	0	0	3	1
	Prerequisite – Basic Electrical and Electronics Engineering				
	Course Designed by – Department of Electrical & Electronics Engineering				

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

COURSE OUTCOMES (COs)

CO1	Students will able to handle basic electrical equipments.
CO2	Students will able to do staircase wiring.
CO3	Students will able to understand domestic wiring procedures practically.
CO4	Student will able to assemble electronic systems.
CO5	Students will understand all the fundamental concepts involving electrical engineering
CO6	Students will understand all the fundamental concepts involving electronics engineering

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	M	H	M			L		L	L	M	H	
	CO2		H	M			L		L	L		H	
	CO3		H	M			L		L			H	
	CO4	M	H	M			L		L	L	M	H	
	CO5	M	H	M			L		L		M	H	
	CO6		H				L		L	H		H	

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Professional Elective (PE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
				√					
4	Approval	37th Meeting of Academic Council, May 2015							

I 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

II LIST OF EXPERIMENTS FOR ELECTRONICS ENGINEERING LABORATORY

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**
	Total Contact Hours – 45	0	0	3	1
	Prerequisite – Physics and Chemistry				
	Course Designed by – Department of Physics & Chemistry				

OBJECTIVES: To impart knowledge to the students in practical physics and chemistry

COURSE OUTCOMES (COs)

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 practically understand the chemical reactions.
CO5	Students will Study the magnetic hysteresis and energy product
CO6	Students understand the Determination of Band gap of a semiconductor

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	M	H	M			L		L	L	M	H	M
	CO2		H	M			L		L	L		H	
	CO3		H	M			L		L			H	
	CO4	M	H	M			L		L	L	M	H	M
	CO6		H				L		L	H		H	

3	Category	Humanities & Social Studies (HS)	Basic Sciences (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Term Paper/ Seminar/ Internship (PR)
			√						
4	Approval	37th Meeting of Academic Council, May 2015							

I -LIST OF EXPERIMENTS – PHYSICS

1. Determination of Wavelength, and particle size using Laser
2. Determination of acceptance angle in an optical fiber.
3. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer.
4. Determination of wavelength of mercury spectrum – spectrometer grating
5. Determination of thermal conductivity of a bad conductor – Lee‟s Disc method.
6. Determination of Young‟s modulus by Non uniform bending method
7. Determination of specific resistance of a given coil of wire – Carey Foster‟s Bridge
8. Determination of Young‟s modulus by uniform bending method
9. Determination of band gap of a semiconductor
10. Determination of Coefficient of viscosity of a liquid –Poiseuille‟s method
11. Determination of Dispersive power of a prism - Spectrometer
12. Determination of thickness of a thin wire – Air wedge method
13. Determination of Rigidity modulus – Torsion pendulum

II-LIST OF EXPERIMENTS – CHEMISTRY

1. EstimationofhardnessofWaterbyEDTA
2. EstimationofCopper in brass byEDTA
3. Determination of DOin water (Winkler'smethod)
4. EstimationofChloride in Watersample (Argento metry)
5. Estimationof alkalinityofWater sample
6. Determinationofmolecularweight
7. Conduct metric titration (Simple acid base)
8. Conduct metric titration (Mixture of weak and strong acids)
9. Conduct metric titration using $BaCl_2$vs Na_2SO_4
10. Potentiometric Titration (Fe^{2+} / $KMnO_4$ or $K_2Cr_2O_7$)
11. pH titration (acid & base)
12. Determination of water of crystallization of a crystalline salt (Copper Sulphate)
13. Estimation of Ferric iron by spectrophotometer.

BSS2L7 YOGA FOREMPOWERMENT

L	T	P	C
0	1	2	1

OBJECTIVE:
Providing Value Education to improve the Students' character - understanding yogic life and physical health - maintaining youthfulness - Measure and method in five aspects of life

UNIT I PHYSICAL HEALTH 6

Manavalakalai (SKY) Yoga: Introduction - Education as a means for youth empowerment - Greatness of Education - Yoga for youth Empowerment.

Simplified Physical Exercises: Hand, Leg, Breathing, Eye exercises - Kapalabathi, Makarasana Part I, Makarasana Part II, Body Massage, Acu pressure, Relaxation exercises - Benefits.

Yogasanas 1: Pranamasana - Hastha Uttanasana - Pada Hasthasana - Aswa Sanjalana Asana - Thuvipatha asva Sanjalana asana - Astanga Namaskara - Bhujangasana - Atha Muktha Savasana - Aswa Sanjalana Asana - Pada Hasthasana - Hastha Uttanasana - Pranamasana.

Pranayama: Naddi suddi - Clearance Practice - Benefits.

Simplified Physical Exercise - Kayakalpa Practices - Meditation Practices.

UNIT II LIFE FORCE 6

Reasons for Diseases: Natural reasons (Genetic / imprints, Planetary Position, Natural calamities and climatic changes) - Unnatural reasons (Food habits, Thoughts, Deeds)

Philosophy of Kaya kalpa: Physical body - Sexual vital fluid - Life force - Bio-Magnetism - Mind.

Maintaining youthfulness: Postponing old age - Transformation of food into seven components - Importance of sexual vital fluid - Measure and method in five aspects of life - Controlling undue Passion.

Kayakalpa practice: Aswini Mudra - Ojas breath - Benefits of Kaya Kalpa.

UNIT III MENTAL HEALTH 6

Mental Frequencies: Beta, Apha, Theta and Delta wave - Agna Meditation explanation-benefits.

Shanti meditation: Shanthi Meditation explanation-benefits

Thuriya Meditation: Thuriya Meditation explanation-benefits

Benefits of Blessing: Self blessing(Auto suggestion) - Family blessing - Blessing the others - World blessing - Divineprotection

UNIT IV VALUES 6

Human Values: Self control - Self confidence - Honesty Contentment - Humility - Modesty Tolerance – Adjustment - Sacrifice - Forgiveness

Purity(Body,Dress,Environment) - Physicalpurity-Mentalpurity - Spiritual purity

Social Values :

Non violence - Service Patriotism - Equality

Respectforparentsandelders - careandprotection - Respectforteacher Punctuality - TimeManagement

UNIT V MORALITY (virtues) 6

Importance of Introspection: I - Mine (Ego, Possessiveness)

SixEvilTemperaments-Greed-Anger - Miserliness-Immoralsexualpassion - InferiorityandsuperiorityComplex - Vengeance

Maneuvering of Six Temperaments: Contentment - Tolerance - Charity - Chastity – Equality - Pardon (Forgiveness)

FiveessentialQualitiesacquiredthroughMeditation:Perspicacity – Magnanimity – Receptivity - Adaptability - Creativity(ImprovedMemoryPower)

Total periods: 30

REFERENCE BOOKS:

1. Yoga for modern age - ThathuvagnaniVethathiri Maharishi
2. Simplified Physical Exercises - ThathuvagnaniVethathiri Maharishi
3. Kayakalpam - Thathuvagnani VethathiriMaharishi
4. Thirukkural -Rev.Dr.G.U.pope
5. Mind-ThathuvagnaniVethathiriMaharishi
6. SoundHealththroughyoga-Dr.Chandrasekaran
7. Light on yoga -BKS.lyenger
8. உணவுமுறை – தத்துவஞானிவேதாத்திரிமகரிஷி

BMA 301	MATHEMATICS - III	L	T	P	C
	Total Contact Hours – 75	3	2	0	4
	Prerequisite – Engineering Mathematics I & II				
	Course Designed by – Department. of Mathematics				

OBJECTIVES

- To introduce Fourier series analysis which is central to many applications in engineering apart
- From its use in solving boundary value problems systems.
- To acquaint the student with Fourier transform techniques used in wide variety of situations.
- To introduce the effective mathematical tools for the solutions of partial differential equations
- that model several physical processes and to develop Z transform techniques for discrete time

COURSE OUTCOMES (COs)

CO1	Solve a set of algebraic equations representing steady state models formed in engineering problems
CO2	Fit smooth curves for the discrete data connected to each other or to use interpolation methods over these data tables
CO3	Find the trend information from discrete data set through numerical differentiation
CO4	To summary information through numerical integration
CO5	Solve PDE models representing spatial and temporal variations in physical systems through numerical method
CO6	Have the necessary proficiency of using MATLAB for obtaining the above solution

UNIT-I PARTIAL DIFFERENTIAL EQUATIONS 9+6

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 9+6

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

UNIT-III BOUNDARY VALUE PROBLEMS 9+6

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 9+6

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 up to second order with constant coefficients and simultaneous equations of first order with constant coefficients.

UNIT-V FOURIER TRANSFORMS 9+6

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

TEXT BOOKS:

1. Kreyszig, E.,"Advanced Engineering Mathematics"8th Edition, John Wiley and Sons, (Asia) Pvt., Ltd, Singapore, 2000.
2. Grewal, B.S.,"Higher Engineering Mathematics" (35thEdition), Khanna Publishers, Delhi2000.

REFERENCES:

1. Kandasamy, P., Thilakavathy, K., and Gunavathy,K. "Engineering Mathematics",Volumes 1 and 3(4th Edition) S Chand and Co., New.
2. Narayanan, S.Manicavachangam Pillai, T.K.Ramanaiah, E.,"Advanced mathematics for Engineering Students", Volume2 and 3(2nd Edition), S.Viswanathan (printers & publishers Pvt, Ltd.,) 1992.
3. Venkataraman, M.K,"Engineering Mathematics"Volumes3-A&B, 13th Edition National Publishing Company, Chennai, 1998.
4. Shanmugam,T.N.:http:.www.annauniv.edu/shan/trans.h

BME301	KINEMATICS OF MACHINES	L	T	P	C
	Total Contact Hours - 60	4	0	0	4
	Prerequisite –Engineering Mechanics				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

- 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 (COs)

CO1	Upon completion of this course, the students can understand mechanism and its applications in various field of work
CO2	Students will be able to draw velocity and acceleration diagrams graphically and analytically.
CO3	Understand the analysis method for optimum design.
CO4	Understand the importance of friction in machine elements.
CO5	Understand control mechanism
CO6	Study of gears and its applications

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	H	H			H		L	H		M	M
	CO2						H		L			M	
	CO3						H		L			M	M
	CO4						H		L			M	M
	CO5						H		L			M	M
	CO6						H		L			M	

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
					√				
4	Approval		37th Meeting of Academic Council, May 2015						

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.

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
4. royalmechanicalbuzz.blogspot.com/.../theory-of-**machines**-by-rs-khurmi..

BME302	**THERMODYNAMICS**	**L**	**T**	**P**	**C**
	Total Contact Hours – 60	4	0	0	4
	Prerequisite – MATHEMATICS –I &II				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

- 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.

COURSE OUTCOMES (COs)

CO1	Solve first law thermodynamics based types of problems.
CO2	Solve second law thermodynamics based types of problems.
CO3	Understand Thermodynamic properties of pure substances
CO4	understand Thermodynamic relations & gas laws
CO5	Extend the ideas in implementation of mini/major project
CO6	Understand combustion of fuels

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	H	H			H		L	H		M	M
	CO2						H		L			M	
	CO3						H		L			M	M
	CO4						H		L			M	M
	CO5						H		L			M	M
	CO6						H		L			M	

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
					√				
4	Approval	37th Meeting of Academic Council, May 2015							

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, Reversibility, 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, Availability,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-efficient, 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.

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
4.bookboon.com/en/engineering-**thermodynamics-ebook**

BME303	MECHANICS OF SOLIDS	L	T	P	C
	Total Contact Hours - 60	4	0	0	4
	Prerequisite – Engineering Mechanics				
	Course Designed by – Department of Mechanical Engineering				

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 (COs)

CO1	Upon completion of this course, the students can able to apply mathematical knowledge to calculate shear force & Bending moment diagram
CO2	Understand stress and strain behavior of solids
CO3	Understand and analyze stress behavior.
CO4	analyze the deflection in beams
CO5	Understand thick and thin cylinder
CO6	Upon completion of this course, the students can able to apply mathematical knowledge to calculate the deformation behavior of simple structures.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	G	h	i	j	k	l
2	CO1	H	H	L					M	M		H	H
	CO2	H	H	L					M	M		H	H
	CO3	H	H	L					M	M		H	H
	CO4	H	H	L					M	M		H	H
	CO5	H	H	L					M	M		H	H
	CO6	H	H	L					M	M		H	H
3	Category						√						
4	Approval	37th Meeting of Academic Council, May 2015											

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.

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
6. www.freeengineeringbooks.com/Civil/**Mechanics-of-Solids**-Books.php

BME304	**FLUID MECHANICS AND MACHINERY**	L	T	P	C
	Total Contact Hours – 60	4	0	0	4
	Prerequisite – MATHEMATICS I & II				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

- To achieve 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 (COs)	
CO1	Upon completion of this course, the students can able to apply mathematical knowledge to predict the properties and characteristics of a fluid
CO2	Can critically analyse the performance of pumps and turbines
CO3	Can understand different types of flow.
CO4	Learn Fluid Dynamics
CO5	Learn fluid kinematics
CO6	Understand dimensional analysis

	Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	H	L					M	M		H	H
	CO2	H	H	L					M	M		H	H
	CO3	H	H	L					M	M		H	H
	CO4	H	H	L					M	M		H	H
	CO5	H	H	L					M	M		H	H
	CO6	H	H	L					M	M		H	H

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
					√				
4	Approval	37th Meeting of Academic Council, May 2015							

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.

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
5.https://books.google.co.in/.../**Fluid_Mechanics_and_Machinery**.html?id.

BME305	MANUFACTURING TECHNOLOGY I	L	T	P	C
	Total Contact Hours - 60	4	2	0	3
	Prerequisite – Basic Mechanical Engineering				
	Course Designed by – Department of Mechanical Engineering				

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 (COs)

CO1	Upon completion of this course, the students can able to learn different manufacturing process.
CO2	Understand means of component production
CO3	Students will be able to have hands on experience on machineries
CO4	Understand metal working concepts
CO5	Learn the theory of metal operations cutting
CO6	Will know how to perform simple lathe

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	Cos /POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	H	L					M	M		H	H
	CO2	H	H	L					M	M		H	H
	CO3	H	H						M	M		H	H
	CO4	H	M	L					M	M		H	H
	CO5	M	H	L					M	M		H	H
	CO6	M	H	L					M	M		H	H

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
					√				

4	Approval	37th Meeting of Academic Council, May 2015

UNIT I METAL WORKING PROCESS 9

Mechanical working of metals-hot and cold working-rolling, extrusion, spinning, wiredrawing, 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.

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.

References:

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	L	T	P	C
	Total Contact Hours - 60	2	0	2	3
	Prerequisite – ENGINEERING GRAPHICS				
	Course Designed by – Department of Mechanical Engineering				

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 (COs)

CO1	Students will get good interpretation of machine components
CO2	Students will understand standardization of drawings .
CO3	Student will understand the Indian and International standard components.
CO4	Student will able create drawings to industrial standard.
CO5	Learn what tolerance and fits and assembly
CO6	Learn the difference between free sketching and machine drawing

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	Cos /POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H			L	L	L	L	L	L	
	CO2	H	M	H			L	L	L	L			
	CO3	H	M	H			L	L	L	L			
	CO4	H	M	H			L	L	L	L			
	CO5	H	M	H			L	L	L	L			
	CO6	H	M	H			L	L	L	L			

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
					√				

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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.

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 BOOKS:
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 OF MATERIALS LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours –45	0	0	3	2
	Prerequisite – FMM				
	Course Designed by – Department of Mechanical Engineering				

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 (COs)

CO1	Students will understand flow through pipes
CO2	Students will practically understand different flow measuring equipment .
CO3	Student will understand the strength of components and testing methods.
CO4	Student will understand the characteristics of pumps.
CO5	students study the importance of flow analysis
CO6	students learn deflection and stresses

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H			L	L	L	L	L	L	H
	CO2	H	M	H			L	L	L	L			H
	CO3	H	M	H			L	L	L	L			H
	CO4	H	M	H			L	L	L	L			H
	CO5	H	M	H			L	L	L	L			H
	CO6	H	M	H			L	L	L	L			H

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
					√				
4	Approval	37th Meeting of Academic Council, May 2015							

LIST OF EXPERIMENTS

FLUID MECHANICS LABORATORY

1. Determination of flow through pipes, losses in pipes.
2. Calibration of orificemeter and venture meter
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 LABORATORY

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 LABORATORY

1. Tension test of a mild steel rod
2. Double shear test on mild steel and Aluminum 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 401	NUMERICAL METHODS	L	T	P	C
	Total Contact Hours –75	3	2	0	4
	Prerequisite – Mathematics I, II & III				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

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

COURSE OUTCOMES (COs)

CO1	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.
CO3	Find integral value and differential coefficient based on a given set of values.
CO4	Solve initial value problem of ODE and boundary value problems of PDE.
CO5	Will be able to solve eigen value problems
CO6	Understand the application of differentiation and integration in various fields of engineering.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H			L	L	L	L	L	L	H
	CO2	H	M	H			L	L	L	L			H
	CO3	H	M	M									
	CO4	H	M	H			L	L	L	L			
	CO5	H	M	H									H
	CO6	H	M	H			L	L	L	L			H

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
			√						
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT-1 : SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS 9+6

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) 9+6

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 9+6

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 9+6

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 9+6

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.

TEXT 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.

	DYNAMICS OF MACHINES	**L**	**T**	**P**	**C**
BME401	Total Contact Hours – 60	4	0	0	4
	Prerequisite – Mathematics I & II				
	Course Designed by – Department of Mechanical Engineering				

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 (COs)

CO1	Upon completion of this course, the Students can able to predict the force analysis in Mechanisms
CO2	Learn about the mechanical system and related vibration issues.
CO3	Can be able to solve mechanical system problem.
CO4	Understand static and dynamic balancing
CO5	Understand the application of degrees of freedom and vibrations
CO6	Understand critical speed of shafts

		Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low											
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H			L	L	L	L	L	L	H
	CO2	H	M	H			L	L	L	L			H
	CO3	H	M	M									
	CO4	H	M	H			L	L	L	L			
	CO5	H	M	H									H
	CO6	H	M	H			L	L	L	L			H
3	Category	Humanities and Social studies (HS)		Basic Sciences & Maths (BS)		Engg Sciences (ES)	Professional Core (PC)		Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)		Project/ Seminar/ Internship (PR)
							√						
4	Approval	37th Meeting of Academic Council, May 2015											

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 SYSTEMS12

Forced vibrations with-Constant harmonic excitation-Rotating & Reciprocating unbalance-Excitation of the support-Energy dissipated by damping-Forced vibrations with coulomb, 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.

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.
4. royalmechanicalbuzz.blogspot.com/.../theory-of-**machines**-by-rs-khurmi...

	THERMAL ENGINEERING - I	**L**	**T**	**P**	**C**
BME402	Total Contact Hours - 60	4	0	0	4
	Prerequisite : Thermodynamics				
	Course Designed by – Department of Mechanical Engineering				

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 (COs)

CO1	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.
CO3	Study of Steam Turbines
CO4	Study of vapour power cycles
CO5	Study of rankine power cycles and its application
CO6	Understand the concept of refrigeration and its application

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H			L	L	L	L	L	L	H
	CO2	H	M	H			L	L	L	L			H
	CO3	H	M	M									
	CO4	H	M	H			L	L	L	L			
	CO5	H	M	H									H
	CO6	H	M	H			L	L	L	L			H

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
					√				
4	Approval	37th Meeting of Academic Council, May 2015							

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.

TEXT BOOKS:

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.
3. engg-ebook.blogspot.in › ... › r k rajput › sem 4 › thermal engineering

BME403	**INDUSTRIAL METALLURGY**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Manufacturing Technology				
	Course Designed by – Department of Mechanical Engineering				

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 (COs)

CO1	Upon completion of this course, the students will be able to differentiate materials, their processing, heat treatments in suitable application of mechanical engineering field.
CO2	Student gain knowledge in selecting materials
CO3	Understand mechanical properties of materials
CO4	Understand crystallography techniques
CO5	Learn surface engineering techniques
CO6	Understand fracture and learn to get rid of it.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	H	L					M	M		H	H
	CO2	H	H	L					M	M		H	H
	CO3	H	H						M	M		H	H
	CO4	H	M	L					M	M		H	H
	CO5	M	H	L					M	M		M	M
	CO6	M	H	L					M	M		M	M

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
					√				

4	Approval	37th Meeting of Academic Council, May 2015

UNIT I CRYSTALLOGRAPHY 9

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 9

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 9

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 9

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 9

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.

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.
5. www.studynama.com/.../315-Engineering-materials-**metallurgy**-lecture-n...

BME 404	ENGINEERING METROLOGY AND INSTRUMENTATION	L	T	P	C
	Total Contact Hours –45	3	0	0	3
	Prerequisite – Manufacturing Technology I				
	Course Designed by – Department of Mechanical Engineering				

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 (COs)

CO1	Upon completion of this course, the Students can demonstrate different measurement techniques
CO2	Learn form measurement
CO3	Use of different measuring methods in Industrial environment.
CO4	Understand the application of sensors & transducers
CO5	Student will know the advance measuring systems
CO6	Understand principles of Laser

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1						L						
	CO2		H							L			L
	CO3				H								
	CO4						H			M		M	
	CO5									H		M	
	CO6									M		H	

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
					√				

4	Approval	37th Meeting of Academic Council, May 2015

UNIT I INTRODUCTION TO MEASUREMENTS – LINEAR, ANGULAR 9

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 9

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 9

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 9

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 9

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

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	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Physical Sciences				
	Course Designed by – Department of Civil Engineering				

OBJECTIVES

1. To study the nature and facts about environment.
2. To find and implement scientific, technological, economic and political solutions to environmental problems.
3. To study the interrelationship between living organism and environment.
4. To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
5. To study the dynamic processes and understand the features of the earth's interior and surface.
6. To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

COURSE OUTCOMES (COs)	
CO1	Play an important role in transferring a healthy environment for future generations
CO2	Analyze the impact of engineering solutions in a global and societal context
CO3	Discuss contemporary issues that results in environmental degradation and would attempt to provide solutions to overcome those problems
CO4	Ability to consider issues of environment and sustainable development in his personal and professional undertakings
CO5	Highlight the importance of ecosystem and biodiversity

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	M		H									
	CO2			H									
	CO3			H									
	CO4								L				
	CO5							M					
	CO6									L			

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
		√							
4	Approval	37th Meeting of Academic Council, May 2015 And 38th meeting of Jan 2016							

UNIT I THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES 9

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 effect on forests and tribal people.

b) Water resources : Use and over-utilization of surface and ground water, flood, drought conflicts over water, dams-benefits and problems.

c) Mineral resources : Uses and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) Food 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 non renewable energy sources, use of alternate energy sources, case studies.

f) Land resources : Land as a resource, Land degradation, man induced landslides, soil erosion and desertification

Role of an individual in conversation of natural resources, Equitable use of resources for sustainable lifestyles.

UNIT II ECOSYSTEMS 8

Concepts of an ecosystem. 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, characteristic features, structure and function of the following ecosystem :- Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, (ponds, streams, lakes, rivers, oceans, estuaries)-

Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation - Ethics : Issues and possible Solutions, Climate change, global warming, acid rain, ozone layer depletion.

UNIT III BIODIVERSITY AND ITS CONSERVATION 7

Introduction and Definition - genetic, species and ecosystems diversity, Biogeographical classification of India - Value 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, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation biodiversity - In-situ and Ex-situ conservation of biodiversity.

Environmental Pollution 7

Definition, Causes, effects and control measures of ;- Air Pollution, Water pollution, Soil Pollution, Marine Pollution, Noise pollution, Thermal pollution, Nuclear hazards. Solid waste Management : Causes, effects and control measures of urban and industrial wastes - Role of an individual in prevention of pollution - Pollution case studies - Disaster Management : floods earthquake, cyclone and landslides.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 8

From Unsustainable to Sustainable development, Urban problems related to energy, nuclear accident and holocaust, case studies, wasteland reclamation, Environmental 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 –

Fireworks and its impact on the Environment – Chemicals used in Fireworks – (Fuel –oxidizing Agent – Reducing Agent –Toxic Materials – Fuel –Binder- Regulator) – Harmful nature of ingredients – chemical effects on health due to inhaling fumes – Noise produced by fire crackers – Noise pollution – Noise level standards for fire crackers – Intensity of sound – Impact on hearing – Safety measures.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations, population explosion-Family Welfare programs, Environment and human health, Human Rights, Value Education, HIV and AIDS, Women and Child Welfare, Role of Information Technology in Environment and Human health - Case Studies.

TEXTBOOKS:

1. Gilbert M.Masters, “Introduction to Environmental Engineering and Science”, Pearson Education Pvt., Ltd., Second Edition, ISBN 81-297-0277-0, 2004.
2. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p

3. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd.,Ahmedabad – 380 013, India, 1989.
4. Benny Joseph, "Environmental Studies"., TATA McGraw Hill, 2010

REFERENCES

1. Trivedi R.K., "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol.I and II, EnviroMedia 2009
2. Cunningham, W.P.Cooper, T.H.Gorhani, "Environmental Encyclopedia", Jaico Publ., House, Mumbai, 2001.
3. Wager K.D. "Environmental Management", W.B. Saunders Co., Philadelphia, USA, 1998.
4. Trivedi R.K. and P.K. Goel, "Introduction to Air Pollution", Techno Science Publications 2013
5. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB),2001.
6. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
7. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
8. Jadhav, H &Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.
9. Mckinney, M.L. & School, R.M. 1996. Environmental Science systems & Solutions, Web enhanced edition. 639p.
10. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p
11. Rao M N. &Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publish Co. Pvt. Ltd. 345p.
12. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut.
13. http://eng.mft.info/uploadedfiles/gfiles/c8e31c9e52d84c3.pdf

BME4L1	**METROLOGY & METALLURGY LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours –45	0	0	3	2
	Prerequisite – Metrology				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

To make the students understand the concept of standardization and interchangeability
To familiarize the students with metallographion structures of different materials .

COURSE OUTCOMES (COs)

CO1	Students will understand the difference between accuracy and precision
CO2	Students will be aware of different measuring equipments .
CO3	Student will have hands on experience in handling a metallurgical microscope .
CO4	Student will understand metallographic structures of different materials.
CO5	Student will understand crystallographic structures of different materials.
CO6	Students will learn to measure the profile of a gear.

	Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H								M			
	CO2											H	L
	CO3									M			
	CO4												L
	CO5												
	CO6					H				M			

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
					√				
4	Approval	37th Meeting of Academic Council, May 2015							

LIST OF EXPERIMENTS:

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 CarbonSteel, 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 LABORATORY – I**	**L**	**T**	**P**	**C**
	Total Contact Hours –45	0	0	3	2
	Prerequisite – MANUFACTURING TECHNOLOGY				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

To make the students understand the concept of standardization and interchangeability

To familiarize the students with metallographion structures of different .

COURSE OUTCOMES (COs)	
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..
CO4	Learn the use of machineries.
CO5	Learn the different methods of manufacturing
CO6	Learn to do force calculations

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H								M			
	CO2											H	L
	CO3									M			
	CO4												L
	CO5												
	CO6					H				M			

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
					√				

4	Approval	37th Meeting of Academic Council, May 2015

LIST OF EXPERIMENTS:

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	L	T	P	C
	Total Contact Hours –30	0	0	2	1
	Prerequisite – ENGLISH I & II				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

To make them master the techniques of professional communication so that they becomeemployable after completing the course.

COURSE OUTCOMES (COs)

CO1	After the completion of the course the students communicate effectively
CO2	Answer interview peer members
CO3	Students can travel abroad
CO4	Adopt good interpersonal skills
CO5	Overcome stage fear
CO6	Develop personality skills

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1								H				
	CO2	H				M			H				
	CO3	H								H	L		L
	CO4					H			H				L
	CO5					M							L
	CO6								H				

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
									√
4	Approval	37th Meeting of Academic Council, May 2015							

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.

	MACHINE DESIGN - I	L	T	P	C
BME501	Total Contact Hours - 75	3	2	0	4
	Prerequisite – ENGINEERING MECHANICS AND DYNAMICS OF MACHINES				
	Course Designed by – Department of Mechanical Engineering				

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 (COs)

CO1	Students will learn to design components
CO2	Students will understand how to select a material
CO3	Students will learn to use the design data book
CO4	Students will learn to obtain an optimum design procedure
CO5	Students will understand various concepts in design
CO6	Students will learn to fabricate/do research using their knowledge attained

UNIT I FUNDAMENTALS 9+6

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 9+6

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 9+6

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 9+6

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 9+6

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.

TEXT BOOKS :

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

REFERENCES :

1. Bhandari V.B – Design of Machine Elements - TataMcGraw 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.
6. www.allexamresults.net/.../download-pdf-textbook-of-**thermal-engineeri**...

	THERMAL ENGINEERING-II	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – THERMAL ENGG. I				
BME502	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

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

COURSE OUTCOMES (COs)

CO1	Learn the fundamental and concepts in IC engines
CO2	Learn Testing of IC engines
CO3	Learn types of air compressors
CO4	Study various principles of gas dynamics
CO5	Learn Air conditioning
CO6	Apply their learnt ideas in their field of work

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H											
	CO2		M										
	CO3												
	CO4										H	M	
	CO5						L				H		M
	CO6							H			H		

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
					√				

4	Approval	37th Meeting of Academic Council, May 2015

UNIT I I.C. ENGINES 9

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 9

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 9

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 9

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

UNIT V AIR CONDITIONING 9

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.

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:

1. Mathur and Mehta, Thermal Engineering-Jain brothers, 1998
2. Ramalingam-Internal combustion engines-SciTech publications, 2003
3. YahyaS.M-Fundamantals of Compressible flow,New Age International(P)NewDelhi, 2008
4. Cohen H, Rogers GFC, Saravanamuttoo HIH, Gas Turbine Theory, Addison Wesley Longman Ltd, 2007
5. www.allexamresults.net/.../download-pdf-textbook-of-**thermal-engineeri**...

BME503	FLUID POWER SYSTEMS	L	T	P	C
	Total Contact Hours –45	3	0	0	3
	Prerequisite – FMM				
	Course Designed by – Department of Mechanical Engineering				

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 (COs)

CO1	Identify hydraulic and pneumatics components.
CO2	Ability to design hydraulic and pneumatic circuits
CO3	Design hydraulic circuits
CO4	Learn the concepts of pneumatic power and design
CO5	Learn to select materials
CO6	Students will learn to design

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	H	L					M	M		H	H
	CO2	H	H	L					M	M		H	H
	CO3	H	H						M	M		H	H
	CO4	H	M	L					M	M		H	H
	CO5	M	H	L					M	M		M	M
	CO6	M	H	L					M	M		M	M

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship
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4	Approval	37th Meeting of Academic Council, May 2015							

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.

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.
5. www.engineeringstudymaterial.net/**ebook/fluid-power**-with-applications/

BME504	**AUTOMOBILE ENGINEERING**	**L**	**T**	**P**	**C**
	Total Contact Hours –45	3	0	0	3
	Prerequisite – MANUFACTURING TECHNOLOGY, MACHINE DESIGN				
	Course Designed by – Department of Mechanical Engineering				

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 (COs)

CO1	Learn vehicle structures
CO2	Students will learn the different types of engines
CO3	Transmission systems will be learnt
CO4	The students will learn about the engine auxiliary systems

CO5	Students will learn about alternate fuels
CO6	Students learn about suspension systems and steering wheels

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	H	L					M	M		H	H
	CO2	H	H	L					M	M		H	
	CO3								M			H	H
	CO4	H	M	L						M			H
	CO5	M	H						M	M		M	M
	CO6	M	H	L					M	M		M	M

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
					√				

4	Approval	37th Meeting of Academic Council, May 2015

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.

TEXT BOOKS:

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.
4. https://books.google.co.in/.../A_Text_Book_of_**Automobile_Engineerin**..

BME505	**MANUFACTURING TECHNOLOGY-II**	**L**	**T**	**P**	**C**
	Total Contact Hours –45	3	0	0	3
	Prerequisite- MANUFACTURING TECHNOLOGY -I				
	Course Designed by – Department of Mechanical Engineering				

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 (COs)

CO1	Learn about surface finishing process
CO2	Learn gear and gear manufacturing process
CO3	Study about non traditional machining techniques
CO4	Upon completion of this course, the students can able to understand high energy rate forming
CO5	Learn the basic concepts of NTM.
CO6	Learn plastic material and its process

	Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low												
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M	H			L	L	L	L	L	L	H
	CO2	H	M	H			L	L	L	L			H
	CO3	H	M	M									
	CO4	H	M	H			L	L	L	L			
	CO5	H	M	H									H
	CO6	H	M	H			L	L	L	L			H

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
					√				
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I SURFACE FINISHING PROCESS 9

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 9

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 9

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) 9

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

UNIT V PLASTIC MATERIALS AND PROCESSES 9

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

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
3. P.N.Rao. Manufacturing Technology - Foundry Forging & Welding, TMH., New Delhi – 2009.
4. www.studynama.com/.../301-**Manufacturing**-**Technology**-1-lecture-notes..

BME5L1	THERMAL ENGINEERING LABORATORY	L	T	P	C
	Total Contact Hours - 45	0	0	3	2
	Prerequisite – Thermal Engineering, Thermodynamics				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

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

COURSE OUTCOMES (COs)

CO1	Upon completion of this course, the students can able to understand the fundamentals in every area of thermal engineering.
CO2	Will understand the concepts in thermal engineering lab
CO3	Will understand the working principle of air-conditioning
CO4	Will understand the working turbines
CO5	Will understand the concept and working of compressors
CO6	Will understand the working principle of IC Engines

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H											
	CO2		H										
	CO3									H			
	CO4										L		
	CO5				M							L	
	CO6							M					L

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
					√				

4	Approval	37th Meeting of Academic Council, May 2015

LIST OF EXPERIMENTS:

Flash and Fire point of liquid fuel
Determination of viscosity using Saybolt and Redwood viscometer
Flue gas analysis using Orsat apparatus
Performance characteristics of a Air blower
Valve timing diagram of a four stroke engine, Port timing diagram of a two stroke engine
Determination of mechanical efficiency of four stroke diesel engine
Determination of mechanical efficiency of two stroke petrol engine

Heat balance test on a four stroke diesel engine
Heat balance test on a four stroke petrol engine
Determination of optimum cooling water rate on a single cylinder diesel engine
Performance test on a multi cylinder petrol engine- Morse test
Test on Air compressor
Performance test on a Refrigeration plant
Performance test on A/C plant
Performance test of Cooling tower

BME5L2	**MANUFACTURING TECHNOLOGY LABORATORY-II**	**L**	**T**	**P**	**C**
	Total Contact Hours –45	0	0	3	2
	Prerequisite – Manufacturing technology I & II				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

- To expose students in understanding various metal cutting operations and commonly used machine tools.

COURSE OUTCOMES (COs)

CO1	Upon completion of this course, the students can able to understand and compare the functions and applications of different metal cutting tools
CO2	Learn operations in metal cutting processes.
CO3	To demonstrate the programming in CNC machining
CO4	Upon completion of this course, the students can able to apply the different metal removing ,finishing and super finishing and for component production
CO5	Learn various cutting tool operations using CNC machines.
CO6	Upon completion of this course, the students can able to understand and compare the

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H											
	CO2		H										
	CO3									H			
	CO4										L		
	CO5				M							L	
	CO6							M					L

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)

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4	Approval	37th Meeting of Academic Council, May 2015							

LIST OF EXPERIMENTS:

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

	INSTRUMENTATION AND DYNAMICS LABORATORY	**L**	**T**	**P**	**C**
BME5L3	Total Contact Hours –45	0	0	3	2
	Prerequisite – Metrology and Instrumentation				
	Course Designed by – Department of Mechanical Engineering				

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 (COs)

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.
CO4	Students will understand the concepts of vibration
CO5	Students will learn balancing of rotors students learn how to use a tachometer
CO6	Students gain hands on experience in the use of instruments

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H											
	CO2		H										
	CO3									H			
	CO4										L		
	CO5				M							L	
	CO6							M					L

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
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4	Approval	37th Meeting of Academic Council, May 2015							

LIST OF EXPERIMENTS:

INSTRUMENTATION LABORATORY

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 LABORATORY

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.

BME5C1	**COMPREHENSION I**	**L**	**T**	**P**	**C**
	Total Contact Hours : Test will be conducted at the end of the semester	0	0	0	1
	Prerequisite – All the courses up to fifth semester				
	Course Designed by – Department. Mechanical Engineering				

OBJECTIVES

- To provide a complete review of Mechanical Engineering topics covered up to fifth semesters, so that a comprehensive understanding is achieved.
- It will also help students to face job interviews, competitive examinations and also to enhance the employment potential.
- To provide overview of all topics covered and to assess the overall knowledge level up to fifth semester.

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 tests involving objective type and oral viva Voce at the end of V semester..

BME601	MACHINE DESIGN II	L	T	P	C
	Total Contact Hours – 60	4	0	0	4
	Prerequisite – Machine design I				
	Course Designed by – Department of Mechanical Engineering				

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 (COs)

CO1	Upon completion of this course, the students can able to successfully design components for a system
CO2	Design gears
CO3	Understand bearings and design
CO4	Understand belt drives and chain drives
CO5	Understand the principle behind design
CO6	Learn calculation of speed reduction , kinematic and ray diagrams

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	H	L					M	M		H	H
	CO2	H	H	L					M	M		H	H
	CO3	H	H						M	M		H	H
	CO4	H	M	L					M	M		H	H
	CO5	M	H	L					M	M		M	M
	CO6	M	H	L					M	M		M	M

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
					√				
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I BEARINGS 12

Design of sliding contact bearings using Somerfield 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.

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. www.faadooengineers.com/.../26687-**Machine-design**-by-shigley-**ebook**-

BME602	**FINITE ELEMENT ANALYSIS**	**L**	**T**	**P**	**C**
	Total Contact Hours – 60	4	0	0	4
	Prerequisite – Numerical Methods				
	Course Designed by – Department of Mechanical Engineering				

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 (COs)

CO1	Upon completion of this course, the students can able to understand different mathematical Techniques used in FEM analysis and
CO2	Understand the concepts of Nodes and elements
CO3	Understand use of FEA in Structural and thermal problem
CO4	Understand the application of FEA in heat transfer problem
CO5	Learn how to do analysis learn the various concepts and types of analysis
CO6	Learn finite element modeling techniques.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M					M			M		
	CO2	H							L		M		
	CO3	H							L		M		L

	CO4											L	
	CO5							M					
	CO6					M							L
3	Category	Humanities and Social studies (HS)		Basic Sciences & Maths (BS)		Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)		Open Elective (OE)	Project/ Seminar/ Internship (PR)	
							√						
4	Approval	37th Meeting of Academic Council, May 2015											

UNIT I AN INTRODUCTION TO FINITE ELEMENT METHODS 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 BAR ELEMENTS 12

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

UNIT III HEAT TRANSFER IN FE 12

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

UNIT IV GAUSS QUADRATURE METHODS 12

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

UNIT V COMPUTERIZED FEA 12

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

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.
5. T.R.Chandraputla , A.D.Belegundu – Introduction to Finite Elements in Engineering – Prentice Hall of India, 2002.
6. S.S.Bhavikati – Finite Element Analysis, New Age International Publishers.
7. https://www.amazon.in/...**FINITE-ELEMENT-ANALYSIS**...**ebook**/.../B0

BME603	**HEAT AND MASS TRANSFER**	**L**	**T**	**P**	**C**
	Total Contact Hours – 60	4	0	0	4
	Prerequisite – Thermal Engineering-II				
	Course Designed by – Department of Mechanical Engineering				

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 (COs)

CO1	Learn steady state state of systems
CO2	Learn unsteady state of systems
CO3	Understand the principles of convection
CO4	Understand the principles of radiation
CO5	Learn the design concepts in mass transfer
CO6	Learn evaporation process in atmosphere

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	M					M			M		
	CO2	H							L		M		
	CO3	H							L		M		L
	CO4											L	
	CO5							M					
	CO6					M							L

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
					√				
4	Approval	37th Meeting of Academic Council, May 2015							

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 radiation,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.

TEXT BOOKS:

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.
5. **book**boon.com/en/momentum-**heat-and-mass-transfer-ebook**

BME604	**CAD/CAM**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – Manufacturing Technology-I				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

This course will enable the student To gain knowledge about the basic fundamentals of CAD.

COURSE OUTCOMES (COs)

CO1	To gain knowledge on how computers are integrated at various levels of planning and manufacturing understand computer aided planning and control and computer monitoring.
CO2	Understand the concepts of CAD/CAM
CO3	Understand writing programs
CO4	Understand to give command
CO5	Learn to draw 2D drawings
CO6	Learn to do 3D modeling

	Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H	H							M			L
	CO2												
	CO3			H			H	M	M				L
	CO4				H						M	M	L
	CO5												
	CO6												L
3	Category	Humanities and Social studies (HS)		Basic Sciences & Maths (BS)	Engg Sciences (ES)		Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)		Open Elective (OE)	Project/ Seminar/ Internship (PR)	
							√						
4	Approval	37th Meeting of Academic Council, May 2015											

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 COMPUTERS9

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 IV 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.

TEXT BOOKS:

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.
4. sbmpme.blogspot.com/2011/01/**cad**-**cam**-cim-p-radhakrishnan.html

BSS601	**VALUE EDUCATION AND PROFESSIONAL ETHICS**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – Professional Courses				
	Course Designed by – Department of Management Studies				

OBJECTIVES

- To teach the philosophy of Life, personal value, social value, mind cultural value and personal health
- To teach professional ethical values, codes of ethics, responsibilities, safety, rights and related global issues.

COURSE OUTCOMES (COs)

CO1	To learn about philosophy of Life and Individual qualities
CO2	To learn and practice social values and responsibilities
CO3	To learn and practice mind culture, forces acting on the body and causes of diseases and their curing
CO4	To learn more of Engineer as Responsible Experimenter.
CO5	To learn more of Risk and Safety assessment with case studies.
CO6	To learn more of Responsibilities and Rights as Professional and facing Global Challenges

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1			M		H		M	H	M	L	L	M
	CO2			M		H		M	H	M	L	L	M
	CO3			M		H		M	H	M	L	L	M
	CO4			H		H		M	H	M	L	L	M
	CO5			H		H		M	H	M	L	L	M
	CO6			H		H		M	H	M	L	L	M

3	Category	Humanities & Social Studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (GOE	Project/ Seminar/ Internship (PR)
		√							
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I : PHILOSOPHY OF LIFE AND INDIVIDUAL QUALITIES 9

Human Life on Earth - Purpose of Life, Meaning and Philosophy of Life. The Law of Nature – Protecting Nature /Universe. Basic Culture - Thought Analysis - Regulating desire - Guarding against anger - To get rid of Anxiety – The Rewards of Blessing - Benevolence of Friendship - Love and Charity - Self – tranquility/Peace

UNIT II : SOCIAL VALUES (INDIVIDUAL AND SOCIAL WELFARE) 9

Family - Peace in Family, Society, The Law of Life Brotherhood - The Pride of Womanhood – Five responsibilities/duties of Man : - a) to himself, b) to his family, c) to his environment, d) to his society, e) to the Universe in his lives, Thriftness (Thrift)/Economics. Health - Education - Governance - People's Responsibility / duties of the community, World peace.

UNIT III: MIND CULTURE & TENDING PERSONAL HEALTH 9

Mind Culture - Life and Mind - Bio - magnetism, Universal Magnetism (God –Realization and Self Realization) - Genetic Centre – Thought Action – Short term Memory – Expansiveness – Thought – Waves, Channelising the Mind, Stages - Meditation, Spiritual Value. Structure of the body - the three forces of the body- life body relation, natural causes and unnatural causes for diseases, Methods in Curing diseases

UNIT IV: ENGINEERING AS SOCIAL EXPERIMENTATION ANDENGINEERS'S RESPONSIBILITIES FOR SAFETY 9

Engineering as Experimentation – Engineer as Responsible Experimenters – Codes of Ethics – The Challenger, case study. Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – The Three Mile Island and Chernobyl case studies.

UNIT V: ENGINEERS'S RESPONSIBILITIES FOR RIGHTS AND GLOBAL ISSUES 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.Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development –Engineers as Managers – Consulting Engineers – Engineers as Expert Eye Witnesses and Advisors – Moral Leadership

TEXT BOOKS:

1. Value Education for Health, Happiness and Harmony, The World Community Service, Centre Vethathiri Publications (Unit 1 – III).
2. Mike W Martin and Roland Schinzinger, Ethics In Engineering, Tata McGraw Hill, Newyork 2005 (Units IV & V)

REFERENCES:

1. Philosophy of Universal Magnetism (Bio - magnetism, Universal Magnetism) The World Community Service Centre Vethathiri Publications (for Unit III)

2. Thirukkural with English Translation of Rev. Dr. G.U. Pope, Uma Publication, 156, Serfoji Nagar, Medical College Road,Thanjavur 613 004 (for Units I - III)
3. R S Nagaarazan, Textbook On Professional Ethics And Human Values, New Age International Publishers, 2006 (for Units IV-V)
4. Charles D Fledderman, Engineering Ethics, Prentice Hall, New Mexico, 2004 (for Units IV-V).
5. ww.apjce.org/files/APJCE_12_3_205_216.**pdf**

	HEAT TRANSFER LABORATORY	**L**	**T**	**P**	**C**
	Total Contact Hours –45	0	0	3	2
	Prerequisite – Thermal Laboratory				
BME6L1	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES: To make the students to understand heat transfer characteristics materials and equipment.

COURSE OUTCOMES (COs)

CO1	To understand the mechanisms of heat transfer under steady and transient conditions.
CO2	To understand the concepts of heat transfer through extended surfaces.
CO3	To learn the thermal analysis and sizing of heat exchangers and to understand the basic
CO4	**T**he students can able to understand different heat transfer equipments
CO5	Apply different heat and mass transfer principles of different applications.
CO6	Will practically know about wind tunnel

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H							M			L	
	CO2	H							M			L	
	CO3			H	H	H						L	
	CO4					M						L	L
	CO5					M							L
	CO6						M	M	M				L

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
					√				

4	Approval	37th Meeting of Academic Council, May 2015

LIST OF EXPERIMENTS:

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

	CAD/CAM Laboratory	**L**	**T**	**P**	**C**
BME6L2	Total Contact Hours –45	0	0	3	2
	Prerequisite – CAD /CAM/CIM				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

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

COURSE OUTCOMES (COs)

CO1	Understand the benefits of computer aided design
CO2	Knowledge of CNC.
CO3	Understand the computer aided manufacturing of machine elements.
CO4	**Students learn 2D modeling**
CO5	Students learn modeling 3d Drawings
CO6	Students learn writing commands

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H							M			L	
	CO2	H							M			L	
	CO3			H	H	H						L	
	CO4					M						L	L
	CO5					M							L
	CO6						M	M	M				L

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
					√				

4	Approval	37th Meeting of Academic Council, May 2015

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 LABORATORY

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 FANUC, SINUMERIC etc.,

BME6L3	**TECHNICAL SEMINAR – II**	**L**	**T**	**P**	**C**
	Total Contact Hours –30	0	0	2	1
	Prerequisite – Technical seminar I				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

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

COURSE OUTCOMES (COs)

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 learn to overcome stage fear
CO6	Students learn to develop their personality skills

		Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low											
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	L
2	CO1	H							M			L	
	CO2	H						H	M			L	H
	CO3			H	H	H		H				L	
	CO4					M		H				L	H
	CO5					M							H
	CO6						M	H	M				H
3	Category	Humanities and Social studies (HS)		Basic Sciences & Maths (BS)		Engg Sciences (ES)	Professional Core (PC)		Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)		Project/ Seminar/ Internship (PR)
							√						
4	Approval	37th Meeting of Academic Council, May 2015											

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	L	T	P	C
	Total Contact Hours –45	3	0	0	3
	Prerequisite – Manufacturing Engg.,				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES: To impart knowledge in undertaking market research, demand forecasting and costing for designing plant, operation, production, maintaining standards of professional ethics.

COURSE OUTCOMES (COs)

CO1	Learn production & productivity
CO2	Demonstrate the knowledge of designing plants and scheduling
CO3	Study about work study techniques
CO4	A systematic understanding of industrial psychology
CO5	Learn quality control
CO6	Learn sampling and probability distribution

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	L
2	CO1			H	H								
	CO2				H					H			H
	CO3	L						H					H
	CO4		L					H		M			H
	CO5												H
	CO6									M			H

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
					√				

4	Approval	37th Meeting of Academic Council, May 2015

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

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.
2. onlinevideolecture.com/**ebooks**/?subject=**Industrial**%20**Engineering**...

BME 702	**OPERATIONS RESEARCH FOR ENGINEERS**	**L**	**T**	**P**	**C**
	Total Contact Hours – 60	4	0	0	4
	Prerequisite – Mathematics I, II & III				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

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

COURSE OUTCOMES (COs)

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.
CO6	Learn industrial concepts of inspection and output

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	L
2	CO1		H						H				
	CO2	H						L					H
	CO3	H							M				H
	CO4				M		M			H			
	CO5												
	CO6												H

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
			√						
4	Approval	37th Meeting of Academic Council, May 2015							

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.

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
3. Paneerselvam.R. "Operations Research", PHI, New Delhi. 2009 .
4. www.**study**nama.com/.../312-**Operations**-**Research**-lecture-notes-**ebook**-**p**...

BMT7L1	**FLUID POWER AUTOMATION LABORATORY & MICROPROCESSOR LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours –45	0	0	3	2
	Prerequisite – FMM				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

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

COURSE OUTCOMES (COs)

CO1	Upon completion of this course, the student can able to understand the use of hydraulic and pneumatic systems
CO2	Learning different mechanisms
CO3	Able to design logical circuits.
CO4	Will gain knowledge CMM based instruments.
CO5	Apply different FMM principles of different applications.
CO6	Will practically gain knowledge in FMM analysis

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H							M			L	
	CO2	H							M			L	
	CO3			H	H	H						L	
	CO4					M						L	L
	CO5					M							L
	CO6						M	M	M				L

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
					√				
4	Approval	37th Meeting of Academic Council, May 2015							

LIST OF EXPERIMENTS:

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 LABORATORY**	**L**	**T**	**P**	**C**
	Total Contact Hours –45	0	0	3	2
	Prerequisite – CAD /CAM Laboratory				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

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

COURSE OUTCOMES (COs)

CO1	Understand the benefits of computer aided design
CO2	Knowledge of SIMULATION.
CO3	Understand the computer aided manufacturing of machine elements.
CO4	Students learn 2D design and modeling in MATLAB
CO5	Students learn modeling 3d Drawings
CO6	Students learn writing commands

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H							M			L	

	CO2	H							M			L	
	CO3			H	H	H						L	
	CO4					M						L	L
	CO5					M							L
	CO6						M	M		M			L
3	Category	Humanities and Social studies (HS)		Basic Sciences & Maths (BS)	Engg Sciences (ES)		Professional Core (PC)	Core Elective (CE)		Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)	
							√						
4	Approval	37th Meeting of Academic Council, May 2015											

LIST OF EXPERIMENTS:

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

BME7P1	**TERM PAPER**	**L**	**T**	**P**	**C**
	Total Contact Hours – 60	0	0	4	2
	Prerequisite – Professional Courses				
	Course Designed by – Department of Mechanical Engineering				

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 (COs)

CO1	the student can able to design the components they required
CO2	Understand the different fabrication processes.
CO3	will gain confidence to face industrial environment
CO4	able to apply the knowledge attain to real life problems which he / she may have to face in future as an engineer.

CO5	The students work in groups and solve a variety of problems given to them.
CO6	The problems given to the students should be of real like industrial problems selected by a group of faculty members of the concerned department

The objective of this project is to provide opportunity for the students to implement their skills acquired in the previous semesters to undergo learning in research oriented areas, collecting survey and documents on the growing fields in technology
The students as an individual will choose onetopic which will be the topic of his project work in the final semester. Every project work shall have a guide who will be the faculty of the institution.

The topic chosen may be related to 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 student is required to collect literature survey regarding the selected topic to be extended in the next semester. He has to demonstrate its working apart from submitting the project report. The report should contain study material, literature and whatever further deemed important related to his work.

BME8C1	**COMPREHENSION-II**	**L**	**T**	**P**	**C**
		0	0	0	1
	Prerequisite – All the courses up to VIII Semester				
	Course Designed by – Department of Mechanical Engineering				

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.

COURSE OUTCOMES (COs)

CO1	Understanding of the fundamentals of all the courses up to the VIII semester

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H							M			L	
	CO2	H						H	M			L	H
	CO3			H	H	H		H				L	
	CO4					M		H				L	H
	CO5					M							H
	CO6						M	H	M				H

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
									√
4	Approval		37th Meeting of Academic Council, May 2015						

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 tests involving objective type and Viva Voce questions at the end of VIII for the starting from I to VIII semesters..

BME8P1	**PROJECT WORK**	**L**	**T**	**P**	**C**
	Total Contact Hours –18 periods per week	0	0	18	9
	Prerequisite – Professional Courses				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

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.	
COURSE OUTCOMES (COs)	
CO1	Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, project work details and conclusion.
CO2	This final report shall be typewritten form as specified in the guidelines.
CO3	The continuous assessment shall be made as prescribed in the regulations.
CO4	The student can able to design the components they required
CO5	Understand the different fabrication processes.
CO6	Will gain confidence to face industrial environment.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H							M			L	
	CO2	H						H	M	H		L	H
	CO3			H	H	H		H				L	
	CO4					M		H		M		L	H
	CO5					M							H
	CO6						M	H	M				H

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
									√
4	Approval		37th Meeting of Academic Council, May 2015						

The objective of this project is to provide opportunity for the students to implement their skills acquired in the previous semesters to undergo learning in research oriented areas, collecting survey and documents on the growing fields in technology
The students as an individual will choose onetopic which will be the topic of his project work in the final semester. Every project work shall have a guide who will be the faculty of the institution.

The topic chosen may be related to 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 student is required to collect literature survey regarding the selected topic to be extended in the next semester. He has to demonstrate its working apart from submitting the project report. The report should contain study material, literature and whatever further deemed important related to his work.

CORE ELECTIVE – I

BME001	ADVANCED INTERNAL COMBUSTION ENGINES	L	T	P	C
	Total Contact Hours –45	3	0	0	3
	Prerequisite – BASIC MECHANICAL ENGG.				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

update the knowledge in engine exhaust emission control and alternate fuels and enable the students to understand the recent developments in IC Engines **.**

COURSE OUTCOMES (COs)

CO1	Will update the knowledge about spark ignition engine.
CO2	Will update the knowledge about compression ignition engine.
CO3	Will understand about catalytic convertor
CO4	Will understand the concept of alternate fuels .
CO5	Understand the different recent engines
CO6	Will gain confidence about gasoline engine

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1								M			L	
	CO2			H				M	H	H		L	L
	CO3			H	H	M		M			L	L	
	CO4					M		M		M		L	H
	CO5					M							H
	CO6						M	H	M				L

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
					√				

4	Approval	37th Meeting of Academic Council, May 2015

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.

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.
2. https://www1.eere.energy.gov/hydrogenandfuelcells/pdfs/28890yy.pdf

BME002	SPECIAL CASTING PROCESSES	L	T	P	C
	Total Contact Hours –45	3	0	0	3
	Prerequisite – MANUFACTURING TECHNOLOGY				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

Understand the concepts of molding and casting

COURSE OUTCOMES (COs)

CO1	understand and perform basic casting processes .
CO2	Understand shell moulding process
CO3	Study about Investment casting
CO4	Understand centrifugal casting
CO5	Study about Continous casting
CO6	Study about Full mould process

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	L
2	CO1								M			L	
	CO2			H				M	H	H		L	L
	CO3			H	H	M		M			L	L	
	CO4					M		M		M		L	H
	CO5					M							H
	CO6						M	H	M				L

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
					√				
4	Approval	37th Meeting of Academic Council, May 2015							

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 INVESTMENT 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, Aluminum, brass material in continuous casting. CO_2 Mould / Core hardening process – Principle of full Mould process – Applications , Special processes like Squeeze casting and eletroslag casting processes.

REFERENCES :

1. P.L. Jain, Foundry Technology, 1992.
2. R.A.Higgins, Engineering Metallurgy – Vol. II, 1998.
3. phindia.com/.../**casting**-technology-and-**cast**-alloys-chakrabarti-a-k--isbn.

BME003	MECHANICAL VIBRATIONS	L	T	P	C
	Total Contact Hours –45	3	0	0	3
	Prerequisite – KINEMATICS OF MACHINES, DYNAMICS OF MACHINES				
	Course Designed by – Department of Mechanical Engineering				

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 (COs)

CO1	Understand in detail about principles of vibration
CO2	Will able to understand undamped free vibration
CO3	Will understand in detail about transient vibration
CO4	Will update the knowledge in multi degrees of freedom
CO5	Understand the different vibration absorber
CO6	Study about vibrometers

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	L
2	CO1	H							M			L	
	CO2	H		H				M	H	H		L	L
	CO3	H		H	H	M		M			L	L	
	CO4	H				M		M		M		L	L
	CO5	H				M							L
	CO6	H					M	H	M				L

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
					√				

4	Approval		37th Meeting of Academic Council, May 2015

UNIT I PRINCIPLES OF VIBRATION **9**

Vibration principle- Equilibrium & Energy methods- Free vibrations-Viscous & coulomb damping- Forced vibration EXCITATION- Transmissibility –Resonance -Characteristics.

UNIT II TWO DEGREES OF FREEDOM **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 TRANSIENT VIBRATION **9**

Transient vibration – Time dependency – Laplace transforms – Step inputs – Pulse inputs – Duhamel's integral – Phase plane method – Shock spectrum.

UNIT IV MULTI DEGREES OF FREEDOM **9**

Multi degrees of freedom – Equations of motion – Solution –Orthogonality of normal modes – Continuous system – Free & forced vibrations – Vibration analysis by FEM.

UNIT V VIBRATION INSTRUMENTS **9**

Vibration instruments – Vibration absorber –Elastically supported dampers – Seismic instruments –Vibrometers – Pickups – Accelerometers – Mounting instruments – Amplitude & phase distortions.

TEXTBOOKS

1. G.K.Grover – Mechanical Vibrations – Namchand & Bros. 2001.
2. V.P.Singh - Mechanical Vibrations –Dhanpat Rai & Co, 2005.

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. S.P.Timoshenko – Vibration Problems in Engineering – CBS Publishers, 1985.

4. booksformech.blogspot.com/.../**mechanical-vibrations**-by-vpsingh-pdf.ht..

BME004	**PLANT LAYOUT AND MATERIAL HANDLING**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisite –MANUFACTURING TECH I & II				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

To equip students with adequate knowledge for running an organization and to understand the integration of material handling systems.

COURSE OUTCOMES (COs)

CO1	Understand the procedures for systematic integration of organization.
CO2	Will understand various techniques and tools of layout planning.
CO3	Students will be able to get knowledge on industrial layouts.
CO4	Understand material handling systems
CO5	Learn the concepts of industrial building
CO6	Learn the concepts of industrial utilities

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	L

2	CO1	H											
	CO2	H		H				L					
	CO3	H		H		M	M			L		L	
	CO4	H		H									L
	CO5	H					M		M				
	CO6	H		H									L
3	Category	Humanities and Social studies (HS)		Basic Sciences & Maths (BS)	Engg Sciences (ES)		Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)		Open Elective (OE)		Project/ Seminar/ Internship (PR)
								√					
4	Approval			37th Meeting of Academic Council, May 2015									

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.

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.
4. https://books.google.com/.../**Plant_Layout_and_Material_Handling**.html?...
5.

CORE ELECTIVE – II

BME005	DESIGN OF HEAT EXCHANGERS	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – HEAT AND MASS TRANSFER				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

To learn the sizing of heat exchangers, thermal and mechanical stress analysis for various heat exchange applications.

COURSE OUTCOMES (COs)

CO1	Will understand concepts and working principle of heat exchangers.
CO2	Will understand shell and tube type heat exchanger design.
CO3	Will able to do compact heatexchanger design.
CO4	Will understand the concept of condenser and evaporator.
CO5	Student learns about cooling tower
CO6	Student understands installation of cooling tower

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H											
	CO2			H		L				H		L	
	CO3	H					M						
	CO4			H		L		M					L
	CO5									H			
	CO6	H				L							L

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
						√			

4	Approval	37th Meeting of Academic Council, May 2015

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.

TEXTBOOK:

1.R.K.Rajput- Heat and mass Transfer- S Chand Publications, Jan 2008

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.
4. Holger Martin - Heat exchangers – Hemi sphere Publishing Corporation, London.
5. https://www.crcpress.com/**Heat-Exchanger-Design**-Hand**book**/.../978142...

BME006	COMBUSTION ENGINEERING	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – BASIC MECHANICAL ENGINEERING				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

To understand and analyze the combustion with emphasis on engineering applications.

COURSE OUTCOMES (COs)

CO1	Understand various types of fuels and its ppts
CO2	Understand the concept of gaseous fuels
CO3	Will able to differentiate gaseous and liquid fuels
CO4	Will understand the concept of solid fuels
CO5	Student learns about fluidized bed combustion
CO6	Student understands the fundamentals in combustion of fuels.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	L
2	CO1	H											
	CO2	H		H				L					
	CO3	H		H		M	M			L		L	
	CO4	H		H									L
	CO5	H					M		M				
	CO6	H		H									L

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
						√			

4	Approval	37th Meeting of Academic Council, May 2015

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.

TEXTBOOK:

1. Yunus.A.Cengel- A textbook of Thermodynamics

REFERENCES:

1. Gary.L.Borman, Combustion Engineering-McGraw Hill international Edition,1998
2. Roger.A.Strehlow-Combustion fundamentals- McGraw Hill international Edition,1989.
3. www.goodreads.com/book/show/3785353-**combustion-engineering**

BME007	**COMPOSITE MATERIALS AND TECHNOLOGY**	**L**	**T**	**P**	**C**
	Total Contact Hours –45	3	0	0	3
	Prerequisite – machine design , Industrial Metallurgy				
	Course Designed by – Department of Mechanical Engineering				

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.

COURSE OUTCOMES (COs)

CO1	Will understand basic introduction of composite material
CO2	Will understand the fundamentals of fibres and polymers
CO3	Understanding the manufacturing process .
CO4	Thermo-mechanical behavior and study of residual stresses in Laminates during processing. Implementation of Classical Laminate Theory (CLT)
CO5	Study about design of composites
CO6	Understand application of FEM

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H							M			L	

	CO2	H						H	M			L	H
	CO3			H	H	H		H				L	
	CO4					M		H				L	H
	CO5					M							H
	CO6						M	H	M				H
3	Category	Humanities and Social studies (HS)		Basic Sciences & Maths (BS)		Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)		Open Elective (OE)	Project/ Seminar/ Internship (PR)	
									√				
4	Approval			37th Meeting of Academic Council, May 2015									

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 MATERIALS 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.

TEXTBOOKS:

1. Krishnan Chawla ,Composite Materials Science and Engineering, Springer publications,2012.
2. Daniel gay, Composite Materials, CRC Press, 3rd edition.

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.
3.http://www.springer.com/in/book/9780387743646

4.https://books.google.co.in/books/about/Composite_Materials.html?id=5Q6oUTFO0RgC

BME008	**MECHANICS OF FRACTURE**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – MACHINE DESIGN I & II				
	Course Designed by – Department of Mechanical Engineering				

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 (COs)

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	Learn about crack failures
CO3	Understanding of fracture mechanics and its application.
CO4	Learn about fatigue growth
CO5	Will learn about fracture failure modes
CO6	Learn fracture repair and analysis

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

		a	b	c	d	e	f	g	h	i	j	k	L
2	CO1	H											
	CO2			H									
	CO3							M				L	
	CO4	H		H	H	M	M						L
	CO5												L
	CO6	H											L

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
					√				
4	Approval		37th Meeting of Academic Council, May 2015						

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.

TEXTBOOKS:

1. Jean lemative and Jean Louis chboche "Mechanics of solid Materials," Cambridge university press, Cambridge, 1987.
2. Prashant Kumar, Elements of fracture mechanics, wheeler publishing, 1999.

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.https://apm.iitm.ac.in/smlab/kramesh/book_4.htm

CORE ELECTIVE – III

BME009	**DESIGN FOR MANUFACTURING**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – MACHINE DESIGN, MANUFACTURING TECHNOLOGY				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

- 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 (COs)	
CO1	Students will learn the principles of manufacturing
CO2	Students will learn manufacturing design
CO3	Learn design principles of welding
CO4	Learn design principles of forming

CO5	Learn design principles of casting
CO6	Learn design principles of machining and assembly

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	L
2	CO1												
	CO2	H	H							M			
	CO3		H				M				M	H	
	CO4	H											H
	CO5		H				M						
	CO6												H

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
					√				
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I GENERAL DESIGN **9**

General design principle for manufacturing - Process capability- Surface finish – tolerances – features of tolerance – cumulative effect of tolerance – Geometric tolerances.

UNIT II FITS AND ASSEMBLIES **9**

Fits- Selective assembly- Deciding the number of groups, control of axial play- Grouped datum systems- Types- Automated assemblies- laminated shims assemblies.

UNIT III TOLERANCING **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 REDESIGNING **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 DESIGN FOR ASSEMBLY **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.

TEXTBOOK:

1. M.F.Spotts – "Dimensioning & Tolerancing for Quantity Production" – Prentice Hall

REFERENCES:

1.Harry Peck – "Designing for Manufacture" – Pitman Publications, 1973.
2.James G.Bnalla- "Hand book of Product Design for Manufacturing".
3.www.bookchums.com › Books › Free ebooks

BME010	**ADVANCED TURBO MACHINES**	**L**	**T**	**P**	**C**
	Total Contact Hours –45	3	0	0	3
	Prerequisite – HEAT AND MASS TRANSFER				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

To develop skilled manpower in the field of turbo machines with the knowledge of transport processes through the turbo machine passage, analytical, numerical and experimental tools for design, operation, performance evaluation and innovative research in the area of turbo machines"

COURSE OUTCOMES (COs)

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
CO4	Learn the principle of machineries
CO5	Learn axial and radial flow turbines
CO6	Learn the principles and application of turbines

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	L
2	CO1												
	CO2	H	H							M			
	CO3		H				M				M	H	
	CO4	H											H
	CO5		H				M						
	CO6												H

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
					√				

4	Approval	37th Meeting of Academic Council, May 2015

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 IMPELLER BLADES 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 efficiency, work down 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.

TEXTBOOKS:

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.

REFERENCES:

1. Earl Logan Jr, Ramendra Roy.,Handbook of Turbo Machinery., CRC Press.
2. https://books.google.co.in/books/about/Advanced_topics_in_turbomachinery_techno.html?id=qs9QAAAAYAAJ&redir_esc=y

BME011	**PROCESS PLANNING AND COST ESTIMATION**	**L**	**T**	**P**	**C**
	Total Contact Hours - 60	3	1	0	3
	Prerequisite – INDUSTRIAL ENGINEERING				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

To introduce the process planning concepts to make cost estimation for various products after process planning

COURSE OUTCOMES (COs)

CO1	Understand the various processes planning.
CO2	Learn to estimate cost
CO3	Learn to estimate various cost elements
CO4	Learn to estimate production cost
CO5	Learn to fix foundry cost

CO6	Learn the find machining time estimation

		Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low											
1	COs/POs	a	b	c	d	e	F	g	h	i	j	k	l
2	CO1	H											
	CO2				H							H	
	CO3	M						H		H			H
	CO4				H		M					H	
	CO5							M		H			H
	CO6	L											H

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
						√			
4	Approval	37th Meeting of Academic Council, May 2015							

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 Timefor Lathe operations – Estimation of Machining TimeforDrilling, Boring, Shaping, Planning, Milling and Grinding operations - Illustrative examples.

TEXTBOOKS:

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

REFERENCES :

1. Namua Singh, System Approach to computer integrated Design and Manufacturing, John Wiley & Sons,Inc.,1996.
3. Joseph G Monks, Operation Management, Theory & Problems, McGraw Hill Book Company, 1987.
4. T.R.Banga and S.C.Sharma, Estimations and Costing, Khanna Publishers,1988.
5. G.B.S.Narang and V.Kumar, Production and Costing, Khanna Publishers, 1995.
6. https://books.google.com/books?id=A9-ZXblNrPoC

BME012	**JIGS FIXTURES AND PRESS TOOLS**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – MANUFACTURING TECHNOLOGY				
	Course Designed by – Department of Mechanical Engineering				

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 (COs)

CO1	Will gain knowledge on locating and clamping devices
CO2	Will understand the types and use of jigs
CO3	Will learn the use and design of fixtures
CO4	Will learn and design the use of press tools
CO5	Learn types of presses
CO6	Understand concept of dies

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H											
	CO2	H		H	M					H			H
	CO3			H			M						H
	CO4	H		H					M			L	L
	CO5	H											L
	CO6	H		H									

3	Category	Humanities and Social studies (HS)	Basic Sciences &Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
					√				
4	Approval		37th Meeting of Academic Council, May 2015						

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.

TEXTBOOK:

1. Design of Jigs, Fixtures and Press tools, C.Elanchezhian,T.Sunderselvan, B.Vijayaramnath, Eswar Press, 2005.

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. https://www.overdrive.com/media/.../design-of-**jigs-fixtures-and-press-to**...

NON MAJOR ELECTIVE-I

BGE 001	VIBRATION CONTROL AND MONITORING	L	T	P	C
	Total Contact Hours - 45	3	1	0	3
	Prerequisite – Kinematics of Machines & Dynamics of Machines				
	Course Designed by – Department of Mechanical Engineering				

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 (COs)

CO1	Understand the principles of vibration
CO2	Learn the types of vibration
CO3	Gain knowledge in vibration control
CO4	Gain knowledge in vibration monitoring
CO5	Undergo derivations related to vibrations
CO6	Learn dynamic balancing and alignment of machinery

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H											
	CO2	H		H	M					H			H
	CO3			H			M						H
	CO4	H		H					M			L	L
	CO5	H											L
	CO6	H											

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
						√			

4	Approval	37th Meeting of Academic Council, May 2015

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.

TEXTBOOKS:

1. Singiresu S.Rao. "Mechanical Vibration". Addison- Wesley Publishing Co.2004
2. Rao J.S. "Vibratory Condition Monitoring of Machines" CRC Press. 2000.

REFERENCES:

1.J.O. Den Hartog- "Mechanical Vibrations" McGraw Hill New York.1985.
2.Science Elsevier-"Hand book of Condition Monitoring" ELSEVIER SCIENCE,1996.
3.https://www.overdrive.com/media/118481/**vibration**-with-**control**

BGE002	**WIND AND SOLAR ENERGY**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – BASIC MECHANICAL ENGINEERING				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

To equip students with adequate knowledge on the need for alternate energy sources, Potential of solar and wind options.

COURSE OUTCOMES (COs)

CO1	Student learns about modelling of wind rotor
CO2	Student learns the wind rotor design
CO3	Student learns the speed control
CO4	Student learns the use of solar energy in the far future
CO5	Student learns the installation methods for solar panel
CO6	Student understands the use of voltaic cell

	Mapping of Course Outcomes with Program outcomes (POs)

	(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low												
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H											
	CO2			H		L				H		L	
	CO3	H					M						
	CO4			H		L		M					L
	CO5									H			
	CO6	H				L							L
3	Category	Humanities and Social studies (HS)		Basic Sciences & Maths (BS)	Engg Sciences (ES)		Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)		Project/ Seminar/ Internship (PR)	
								√					
4	Approval			37th Meeting of Academic Council, May 2015									

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.

TEXTBOOKS:

1. Rai G.D. , Non – Conventional sources of energy, Khanna Publications, 4th edition, 2004.

REFERENCES:

1. David M. Eggleston and Forrest S.Stoddard, Wind Turbine Engineering Designing – Van Noustrand 1987.
2. Le Gouries D, Wind Power Plants, Theory and Design - Permagon Press, 1982.
3. Putnam Palmer C., Power from Wind – Van Noustrand, 1984.
4. www.global-greenhouse-warming.com/**renewable-energy-eBooks**.html

BGE003	**NEW AND RENEWABLE SOURCES OF ENERGY**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Professional Courses				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

To understand the importance of saving energy

COURSE OUTCOMES (COs)

CO1	The students can able to identify the new methodologies / technologies for effective utilization of renewable energy sources.
CO2	Enhance knowledge on solar and wind energy.
CO3	Get aware about different solar energy storage
CO4	Learn about biomass
CO5	Will gain knowledge on sources of energy
CO6	Will understand power generation

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	L											
	CO2	L						H			H	H	H
	CO3	L		M	M			H	L		H	H	H
	CO4				M				L		H	H	H
	CO5				M			H			H	H	H
	CO6							H			H	H	H

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)

							√		
4	Approval		37th Meeting of Academic Council, May 2015						

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

TEXTBOOK:

1. 1. Rai,G.D. Non – Conventional Sources of Energy, Khanna publications, 4th edition 2004
2. Le Gouries.D, Wind Power Plants, Theory and Design –permagon press,1982.

REFERENCES:

1.David M.Eggleston and Forrest S.Stoddard,Wind Turbine Engineering Designing- Van Noustrand 1987

2.F.S.seiler, Alternate Energy Vehicle Information, Wind Book Inc.,1977

3. Barbara Keiler, Energy Alternatives,Luscentr Books,1990
4. T.Nejat Veziroygal, Alternative Energy Sources-III,Hemisphre Publishing co.,1989.
5. www.studynama.com/.../357-**Renewable-energy-sources-ebook-pdf**-lect..

BGE004	ELECTRONICS FOR MECHANICAL SYSTEMS	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – MECHATRONICS				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

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

COURSE OUTCOMES (COs)

CO1	Upon completion of this course, the students can able to understand digital electronics
CO2	Learn concepts of 8085 architecture
CO3	Learn the concepts of signal generators
CO4	Learn the concepts of programming
CO5	Learn the concepts of applications in mechanical system
CO6	Learn the concepts of braking and steering system

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	L
2	CO1	H											
	CO211		H						H				
	CO3			H		M							H
	CO4				M		L	M		L			
	CO5										L	L	
	CO6												

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
							√		

4	Approval	37th Meeting of Academic Council, May 2015

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 ofSum(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,Weinbridge,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.

TEXTBOOKS:

1.Goankar R.S., Microprocessor Architecture programming and Applications, New Age International.2006.

2.W.Bolton, Mechatronics, Addison Wesley Longman, 2006.

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. Kenneth J.Ayala.”The 8086 Microprocessor: Programming & Interfacing the PC”Delmar Publishers, 2007.
4. Douglas V., Hall, Microprocessors Interfacing,Programming And Hardware, TMH 2007.
5. https://www.amazon.com/**Mech**atronics-**Electronic-mechanical**...**ebook**

NON MAJOR ELECTIVE-II

BGE005	**INDUSTRIAL ROBOTICS**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – MECHATRONICS				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVE:

- 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 (COs)

CO1	Upon completion of this course, the students can able to apply the basic engineering
CO2	To learn about knowledge for the design of robotics.
CO3	Will understand robot kinematics and robot programming.
CO4	Will understand application of Robots
CO5	To learn about force and torque sensing
CO6	To learn about application of robot

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	D	e	f	g	h	i	j	k	l
2	CO1	M											
	CO2					H			M				H
	CO3	M											H
	CO4					H					L		H
	CO5	M		H		H							H
	CO6	M											

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
							√		

4	Approval	37th Meeting of Academic Council, May 2015

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.

TEXTBOOK:

1. Michael P.Groover, Mitchell Weiss, Industrial Robotics Technology Programming and applications, - McGraw Hill International Editions, 1989.

References:

1. K.S.Fu., R.C. Gonalez , C.S.G. Lee, Robotics, Control sensing, Vision and Intelligence, - McGraw Hill International Editions, 1987.
2. Michael – B.Histland, David. G. Aliatoce., Introduction to Mechatronics and Measurement Systems, McGraw Hill International. Edition, 1999.
3. www.e-booksdirectory.com › Engineering

BGE006	**POWER PLANT ENGINEERING**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – BME				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

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

COURSE OUTCOMES (COs)

CO1	Student learns the steam power plant
CO2	Student learns the working of generators

CO3	Student learns the working of turbines
CO4	Student learns the principle of working in wind energy and wind mills
CO5	Student learns the solar energy
CO6	Student understands the economics of power generation

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H											
	CO2			H		L				H		L	
	CO3	H					M						
	CO4			H		L		M					L
	CO5									H			
	CO6	H				L							L

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
						√			

4	Approval		37th Meeting of Academic Council, May 2015

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

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.

4.https://memechanical**engineering**.files.wordpress.com/.../power-plant-**eng**...

BGE007	**GAS DYNAMICS AND SPACE PROPULSION**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45				
	Prerequisite – HEAT AND MASS TRANSFER	**3**	**0**	**0**	**3**
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVE:

- 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

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 understand the jet propulsion
CO5	To learn about the rocket propulsion
CO6	To learn about the types of rocket engine

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	K	L
2	CO1	H											
	CO2		M										
	CO3			H	M		H			H			
	CO4					L			M				M
	CO5							L			L	L	
	CO6												

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
							√		
4	Approval		37th Meeting of Academic Council, May 2015						

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 NORMAL AND OBLIQUE SHOCKS 9

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.

TEXTBOOKS:

1. Yahya S.M. Fundamentals of Compressible Flow, New Age International (P) Ltd., New Delhi, 2003.
2. Ganesan V, Gas Turbines, Tata McGraw-Hill Publishing Company Ltd., 2003.

REFERENCES:

1. Philip G Hill and Carl R. Peterton, Mechanics and Thermodynamics of Propulsion, Addison-Wesley Publishing Company, 1999.
2. Khajuria P.R and Dubey S.P., Gas turbines and Propulsive Systems, Dhanpat RaiPublications (P) Ltd, New Delhi 2003.
3. Cohen H. Rogers GFC, Saravanamuttoo HIH, Gas Turbines Theory, Addison-Wesley Long man Ltd., 2001.
4. freecomputerbooks.com/**Total-Quality-Management**-and-Six-Sigma.htm.

BBA008	TOTAL QUALITY MANAGEMENT	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Professional Courses				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

1. To introduce to the student about the basic terms related to quality and concepts of quality management
2. To familiarize the student about the basic principles of total quality management
3. To acquaint the student with the basic statistical tools used in process control
4. To introduce to the student about the various tools used in implementing and checking total quality management
5. To familiarize the student about the different quality systems used in auditing the quality of a company/industry/organization

COURSE OUTCOMES (COs)

CO1	By understanding about various quality terms, it will be helpful for the student to maintain quality in his/her organization
CO2	The student will be able to formulate new plans/procedures to be implemented to achieve the desired quality status by knowing about the various principles of quality management
CO3	The student will be able to analyze the periodical data in quality control using statistical tools
CO4	The total quality management tools will help the student to understand the procedures in measuring the quality of the organization/process and will also enable him/her to identify the parameters that are improving/depriving the quality
CO5	By knowing about the quality ISO systems, the student will be maintain processes/documentation properly so that the quality maintained by his/her organization gets recognized
CO6	As a whole the students will understand the importance of quality in all the fields of engineering and the social circle.

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1			M		H		M	H	M	L	L	M
	CO2			M		H		M	H	M	L	L	M
	CO3			M		H		M	H	M	L	L	M
	CO4			H		H		M	H	M	L	L	M
	CO5			H		H		M	H	M	L	L	M
	CO6			H		H		M	H	M	L	L	M

3	Category	Humanities & Social Studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (GOE	Project/ Seminar/ Internship (PR)
							√		

4	Approval	37th Meeting of Academic Council, May 2015

UNIT I INTRODUCTION 9

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs – AnalysisTechniques for Quality Costs, Basic concepts of Total Quality Management, HistoricalReview, Principles of TQM, Leadership – Concepts, Role of Senior Management,Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers toTQM Implementation

UNIT II TQM PRINCIPLES 9

Customer satisfaction – Customer Perception of Quality, Customer Complaints, ServiceQuality, Customer Retention, Employee Involvement – Motivation, Empowerment,Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership –Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development,Performance Measures – Basic Concepts, Strategy, Performance Measure.

UNIT III STATISTICAL PROCESS CONTROL (SPC) 9

The seven tools of quality, Statistical Fundamentals – Measures of central Tendencyand Dispersion, Population and Sample, Normal Curve, Control Charts for variables andattributes, Process capability, Concept of six sigma, New seven Management tools.

UNIT IV TQM TOOLS 9

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality FunctionDeployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality LossFunction, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA –Stages of FMEA.

UNIT V QUALITY SYSTEMS 9

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System –Elements, Implementation of Quality System, Documentation, Quality Auditing, TS16949, ISO 14000 – Concept, Requirements and Benefits

TEXT BOOKS:

1. Dale H.Besterfiled, et al., "Total Quality Management", Pearson Education, Inc.2003. (Indian reprint 2004). ISBN 81-297-0260-6.

REFERENCE BOOKS:

1. Evans. J. R. & Lindsay. W,M "The Management and Control of Quality", (5th Edition),South-Western (Thomson Learning), 2002 (ISBN 0-324-06680-5).
2. Feigenbaum.A.V. "Total Quality Management", McGraw-Hill, 1991.
3. Oakland.J.S. "Total Quality Management", Butterworth Hcinemann Ltd., Oxford,1989.
4. Narayana V. and Sreenivasan, N.S. "Quality Management – Concepts and Tasks",New Age International 1996.
5. Zeiri. "Total Quality Management for Engineers", Wood Head Publishers, 1991.
6.freecomputerbooks.com/**Total-Quality-Management**-and-Six-Sigma.htm

NON MAJOR ELECTIVE-III

BGE009	NUCLEAR ENGINEERING	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – THERMAL ENGINEERING				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVE:
To gain some fundamental knowledge about nuclear physics, nuclear reactor, nuclear fuels, reactors and safe disposal of nuclear wastes.

COURSE OUTCOMES (COs)

CO1	Will gain some fundamental knowledge about nuclear physics.
CO2	Will acquire knowledge about nuclear reactor.
CO3	Will understand about nuclear fuels and will become capable of handling nuclear waste.
CO4	Will understand about core thermal design
CO5	Will understand about Disposal of Radio active waste
CO6	To learn about boiling water reactor

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	D	e	f	g	h	i	j	k	l
2	CO1	M											
	CO2					H			M				H
	CO3	M											H
	CO4					H					L		H
	CO5	M		H		H							H
	CO6												

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
							√		

4	Approval	37th Meeting of Academic Council, May 2015

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 NEUTRON 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 REACTORS 9

Boiling water reactor- B.W.R modified Rankine 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.

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.
5. www.springer.com/us/book/9783642488788

BGE010	**RAPID PROTOTYPING**	**L**	**T**	**P**	**C**
	Total Contact Hours –45	3	0	0	3
	Prerequisite – MANUFACTURING TECHNOLOGY				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

- To provide knowledge on different types of Rapid Prototyping systems and its applications in various fields.

COURSE OUTCOMES (COs)

CO1	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.
CO2	Students will be exposed to different types of Rapid prototyping processes, materials used in RP systems and reverse engineering.
CO3	Students will understand steriolithography methods
CO4	Students learn processes of CAD

CO5	Students gain knowledge to develop prototypes												
CO6	Students learn the concepts of rapid tool processing												
	Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low												
1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H											
	CO2	H		H	M					H			H
	CO3			H			M						H
	CO4	H		H					M			L	L
	CO5	H											L
	CO6												

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
							√		
4	Approval		37th Meeting of Academic Council, May 2015						

UNIT I INTRODUCTION 10

Basic operation –impact of rapid proto typing and tooling on product development- benefits-applications.

UNIT II RAPIDPROTOTYPINGPROCESSES 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

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)

BGE011	COMPUTATIONAL FLUID DYNAMICS	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – FMM				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVE:

- 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 create confidence to solve complex problems in the field of fluid flow and heat transfer by using high speed computers
- To enable the students to understand the various discretization methods, solutionprocedures and turbulence modeling.

COURSE OUTCOMES (COs)

CO1	Will acquire 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.
CO4	To learn about calculation of flow field
CO5	To study about TURBULENCE AND ALGEBRAIC MODELS
CO6	To study of heat conduction of FEA

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	D	e	f	g	h	i	j	k	L
2	CO1	M											
	CO2					H			M				H
	CO3	M											H
	CO4					H					L		H
	CO5	M		H		H							H
	CO6	M											

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
							√		
4	Approval		37th Meeting of Academic Council, May 2015						

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.

TEXTBOOKS:

1.Yunus Cengel.,John Cimbala., Fluid Mechanics,TMG.,2014.
2.S .Malasangara., An Introduction to Computational Fluid Dynamics.,2nd edition.,TMG.,2010.

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 McGraw Hill Publishing Company Ltd 1998.
3. H.K.Versteeg&W.Malalasekara-An Introduction to Computational Fluid Dynamics-Longman.
4. **book**boon.com/en/**computational-fluid-dynamics-ebook**

BGE012	MEMS AND NANOTECHNOLOGY	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Engineering Physics I				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVE:

- 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 (COs)

CO1	The students are expected to understand MEMS
CO2	Methods for Processing MEMS materials
CO3	Characteristic techniques of micro system fabrication process
CO4	To expose the students to the evolution of Nano technology
CO5	Also to impart knowledge to the students about nano materials and various nano measurements techniques
CO6	Introduction of nano scale manufacturing

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	L
2	CO1	M											
	CO2					H			M				H
	CO3	M											H
	CO4					H					L		H
	CO5	M		H		H							H
	CO6	M											

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
							√		

4	Approval		37th Meeting of Academic Council, May 2015

UNIT – I INTRODUCTION **9**

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 MEMS MATERIALS AND PROCESSING 9
Overview, metals, semiconductors, ceramic, polymeric and composite materials, Microstereolithography: Introduction, Scanning Method, Projection Method, Applications. LIGA Process: Introduction, Basic Process and Application.

UNIT – III MICRO SYSTEM FABRICATION PROCESSES 9
Photolithography, Chemical Vapor Deposition, Etching, Bulk and Surface Micro Manufacturing.

UNIT – IV NANO-TECHNOLOGY 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 NANO SCALE MANUFACTURING: 9
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

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.

8.www.springer.com/us/book/9783319007793

OPEN ELECTIVE-I

BBA001	PRINCIPLES OF MANAGEMENT AND ORGANIZATIONAL BEHAVIOUR	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – Professional Courses				
	Course Designed by – Department of Management Studies				

OBJECTIVES

- Familiarize the students with the fundamental concepts of Management and to highlight the approaches in organization behavior

COURSE OUTCOMES (COs)

CO1	Understanding the concepts of Management
CO2	Knowledge on Management Functions
CO3	Understanding the Organization Theory & Approach.
CO4	Knowledge on the Concepts of Motivation
CO5	Clear insight on the factors contributing to discipline
CO6	In-depth Understanding about the concepts of Group Behavior

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1			H	H								
	CO2				H					H			H
	CO3	L						H					H
	CO4		L					H		M			H
	CO5												H
	CO6									M			H

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
								√	

4	Approval	37th Meeting of Academic Council, May 2015

UNIT -I NATURE OF MANAGEMENT 9

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 MANAGEMENT PROCESS 9

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 – Hierarchy of objectives – role – Process of MBO – Policy & Strategy – Decision making process – Individual Vs Group Decisions.

UNIT- III ORGANIZATION STRUCTURE 9

Organizing – Theory & Approach –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 ORGANIZATIONAL BEHAVIOUR 9

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 GROUP BEHAVIOUR 9

Groups – Contributing factors –Group Norms, types – Causes – Intergroup relations – Conflict and Resolution – Change Process –Resistance to change.

TEXT BOOKS:

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.

REFERENCE BOOKS :

1. Joseph I. Massie 'Essentials of Management', Prentice Hall of India Pvt. Ltd., New Delh-110011, 2004.
2. L.M. Prasad "Principles and Practice of Management", Sultan Chand & Sons.2001
3. Uma Sekaran, "Organizational Behaviour", Tata McGraw Hill, 2007
4. https://www.extension.harvard.edu

BBA002	**ENTREPRENEURSHIP DEVELOPMENT**	**L**	**T**	**P**	**C**
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – Professional Courses				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES:

- To learn about types of entrepreneurship.
- To study about major motivation methods.
- To study about government policies for small scale industries

COURSE OUTCOMES (COs)	
CO1	To learn difference between entrepreneur and intrepreneur.
CO2	To learn about entrepreneurship development programs.
CO3	To study about economic feasibility methods.
CO4	To learn about taxation.
CO5	To study about corrective measures methods.
CO6	To learn about Steps Involved in Setting up a Business

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	G	h	i	j	k	l
2	CO1												
	CO2	M			M				M				H
	CO3							H			H		H
	CO4					L			M				H
	CO5		L								H		
	CO6	L				L							

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
								√	

4	Approval	37th Meeting of Academic Council, May 2015

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.

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. RabindraKanungo, "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.
3. depintegraluniversity.in/userfiles/**Entrepreneurship**%20**Development**.**pdf.**
4. bookboon.com/en/**entrepreneurship-ebooks**

BBA003	**MARKETING MANAGEMENT**	**L**	**T**	**P**	**C**
	Total Contact Hours –45	3	0	0	3
	Prerequisite – Professional Cour4ses				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES

- To learn about consumer marketing.
- To study about demographic factors
- To study about retailing process

COURSE OUTCOMES (COs)

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.
CO6	Learn to be an entrepreneur

	Mapping of Course Outcomes with Program outcomes (POs) (H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1												
	CO2	M			M				M				H
	CO3							H			H		H
	CO4					L			M				H
	CO5		L								H		
	CO6	L				L							

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
								√	

4	Approval		37th Meeting of Academic Council, May 2015

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.

TEXT BOOKS:

1. Ramasamy and Namakumari, "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.
5. bookboon.com/en/**marketing**-media-**ebooks**

OPEN ELECTIVE-II

BBA 004	**ENGINEERING ECONOMICS AND FINANCIAL MANAGEMENT**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Professional Courses				
	Course Designed by – Department. of Management Studies				

OBJECTIVES

- Acquire knowledge of economics to facilitate the process of economic decision making
- Acquire knowledge on basic financial management aspects
- Develop the skills to analyze financial statements

COURSE OUTCOMES (COs)

CO1	Evaluate the economic theories, cost concepts and pricing policies
CO2	Understand the market structures and integration concepts
CO3	Understand the measures of national income, the functions of banks and concepts of globalization
CO4	Apply the concepts of financial management for project appraisal
CO5	Understand accounting systems
CO6	analyze financial statements using ratio analysis

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low**1**

1	COs/POs	a	b	c	d	e	F	g	h	i	j	K	l
2	CO1												
	CO2	M			M				M				H
	CO3							H			H		H
	CO4					L			M				H
	CO5		L								H		
	CO6	L				L							

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
								√	
4	Approval		37th Meeting of Academic Council, May 2015						

UNIT- I ECONOMICS, COST AND PRICING CONCEPTS 9

Economic theories – Demand analysis – Determinants of demand – Demand forecasting – Supply – Actual cost and opportunity cost – Incremental cost and sunk cost – Fixed and variable cost – Marginal costing – Total cost – Elements of cost – Cost curves – Breakeven point and breakeven chart – Limitations of break even chart – Interpretation of break even chart – Contribution – P/V-ratio, profit-volume ratio or relationship – Price fixation – Pricing policies – Pricing methods.

UNIT –II CONCEPTS ON FIRMS AND MANUFACTURING PRACTICES 9

Firm – Industry – Market – Market structure – Diversification – Vertical integration – Merger – Horizontal integration

UNIT-III NATIONAL INCOME,MONEY AND BANKING, ECONOMIC ENVIRONMENT 9

National income concepts – GNP – NNP – Methods of measuring national income – Inflation – Deflation – Kinds of money – Value of money – Functions of bank – Types of bank – Economic liberalization – Privatization – Globalization

UNIT- IV CONCEPTS OF FINANCIAL MANAGEMENT 9

Financial management – Scope – Objectives – Time value of money – Methods of appraising project profitability – Sources of finance – Working capital and management of working capital

UNIT- V ACCOUNTING SYSTEM, STATEMENT AND FINANCIAL ANALYSIS 9

Accounting system – Systems of book-keeping – Journal – Ledger – Trail balance – Financial statements – Ratio analysis – Types of ratios – Significance – Limitations

TEXT BOOKS:

1. Prasanna Chandra, ― Financial Management‖ (Theory & Practice) TMH
2. Weston & Brigham, ― Essentials of Managerial Finance‖

REFERENCES:

1. Pandey, I. M., ―Financial Management‖
2. Fundamentals of Financial Management‖- James C. Van Horne.
3. http://stanford.edu/dept/MSandE

BBA005	ENERGY ENGINEERING AND MANAGEMENT	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite – Professional courses				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVES:

To enlighten the student in the field of energy engineering concern with energy efficiency, energy service and facility management

COURSE OUTCOMES (COs)

CO1	Understand different energy resources and their uses.
CO2	Understand different energy conservation techniques.
CO3	Understand the impact energy on environment
CO4	Understand the different types of energy conservation schemes
CO5	Understand Insulated pipe work systems
CO6	Understand Optimal target investment schedules

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	F	g	h	i	j	k	l
2	CO1			H									
	CO2					H			M	L			
	CO3						H			L			
	CO4							M		L			L
	CO5						M		M				L
	CO6												

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
								√	

4	Approval	37th Meeting of Academic Council, May 2015

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 V ENGINEERING ECONOMICS 9

Costing techniques – Optimization cost – Optimal target investment schedules – Finance appraisal – Profitability – Project management.

TEXTBOOK:

1.Amlan Chakrabarthi., Energy Engineering and Management.,PHI.,2011.

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.
3. https://**books**.google.com/**books**/.../**Energy_Engineering_and_Managem**...

BBA006	**INDIAN CONSTITUTION AND SOCIETY**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Professional Courses				
	Course Designed by – Department of Management studies				

OBJECTIVES

To know about Indian constitution. To know about central and state government functionalities in India. To know about Indian society.

COURSE OUTCOMES (COs)

CO1	To understand the historical background and fundamental rights
CO2	To understand the structure and functions of governments
CO3	To understand the Indian social structure
CO4	To gain knowledge in Indian federal system
CO5	To gain knowledge Indian social structure
CO6	To gain knowledge the right of women, children and SC&ST

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	L		H									
	CO2					H			M	L			
	CO3	L					H			L			
	CO4							M		L			L
	CO5	L					M		M				L
	CO6												

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
								√	

4	Approval	37th Meeting of Academic Council, May 2015

UNIT I HISTORY 9

Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for citizens.

UNIT II CENTRAL STRUCTURE 9

Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.

UNIT III STATE STRUCTURE 9

State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts.

UNIT IV PARLIAMENTARY SYSTEM 9

Indian Federal System – Center – State Relations – President's Rule – Constitutional Amendments – Constitutional Functionaries - Assessment of working of the Parliamentary System in India.

UNIT V SOCIAL STRUCTURE 9

Society : Nature, Meaning and definition; Indian Social Structure; Castle, Religion, Language in India; Constitutional Remedies for citizens – Political Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections.

TEXT BOOKS:

1. Durga Das Basu, " Introduction to the Constitution of India ", Prentice Hall of India, New Delhi.

2. R.C.Agarwal, " (1997) Indian Political System ", S.Chand and Company, New Delhi.

REFERENCES:

1. Sharma, Brij Kishore, "Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.
2. U.R.Gahai, "(1998) Indian Political System ", New Academic Publishing House, Jalaendhar.
3. R.N. Sharma, "Indian Social Problems ", Media Promoters and Publishers Pvt. Ltd.
4. Yogendra Singh, "(1997) Social Stratification and Charge in India ", Manohar, New Delhi
5. Maciver and Page, "Society: An Introduction Analysis ", Mac Milan India Ltd., New Delhi.
6. K.L.Sharma, " (1997) Social Stratification in India: Issues and Themes ", Jawaharlal Nehru University, New Delhi.
7.www.cgsird.gov.in/**constitution.pdf**

BBA007	**ENGINEERING ECONOMICS AND COST ANALYSIS**	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	3	0	0	3
	Prerequisite – Industrial Engineering				
	Course Designed by – Department of Mechanical Engineering				

OBJECTIVE:

1.To know about engineering economics and cost analysis.

COURSE OUTCOMES (COs)

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
CO5	To learn about depreciation and Evaluation of public alternatives.
CO6	To learn about design analysis

Mapping of Course Outcomes with Program outcomes (POs)
(H/M/L indicates strength of correlation) H-High, M-Medium, L-Low

1	COs/POs	a	b	c	d	e	f	g	h	i	j	k	l
2	CO1	H											
	CO2		H										
	CO3			M		M							
	CO4				H			H		L		H	
	CO5						L		M		L		
	CO6												L

3	Category	Humanities and Social studies (HS)	Basic Sciences & Maths (BS)	Engg Sciences (ES)	Professional Core (PC)	Core Elective (CE)	Non-Major Elective (NE)	Open Elective (OE)	Project/ Seminar/ Internship (PR)
								√	
4	Approval	37th Meeting of Academic Council, May 2015							

UNIT I INTRODUCTION TO ECONOMICS 8

Introduction to Economics- Flow in an economy, Law of supply and demand, Concept of Engineering Economics – Engineering efficiency, Economic efficiency, Scope of engineering economics- Element of costs, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost, Break-even analysis- V ratio, Elementary economic Analysis – Material selection for product Design selection for a product, Process planning.

UNIT II VALUE ENGINEERING 10

Make or buy decision, Value engineering – Function, aims, Value engineering procedure. Interest formulae and their applications –Time value of money, Single payment compound amount factor, Single payment present worth factor, Equal payment series sinking fund factor, Equal payment series payment Present worth factor- equal payment series capital recovery factor-Uniform gradient series annual equivalent factor, Effective interest rate, Examples in all the methods.

UNIT III CASH FLOW 9

Methods of comparison of alternatives – present worth method (Revenue dominated cash flow diagram), Future worth method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), Annual equivalent method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), rate of return method, Examples in all the methods.

UNIT IV REPLACEMENT AND MAINTENANCE ANALYSIS 9

Replacement and Maintenance analysis – Types of maintenance, types of replacement problem, determination of economic life of an asset, Replacement of an asset with a new asset – capital recovery with return and concept of challenger and defender, Simple probabilistic model for items which fail completely.

UNIT V DEPRECIATION 9

Depreciation- Introduction, Straight line method of depreciation, declining balance method of depreciation-Sum of the years digits method of depreciation, sinking fund method of depreciation/ Annuity method of depreciation, service output method of depreciation-Evaluation of public alternatives- introduction, Examples, Inflation adjusted decisions – procedure to adjust inflation, Examples on comparison of alternatives and determination of economic life of asset.

TEXT BOOKS :

1. PanneerSelvam, R, Engineering Economics, Prentice Hall of India Ltd, New Delhi, 2001.

REFERENCES :

1.Chan S.Park, Contemporary Engineering Economics, Prentice Hall of India, 2002.
2.https://books.google.co.in/books?id=IWRI-5g0uHUC
3.www.springer.com/us/book/9780387970486