SEMESTER I

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	BEN101	English – I	3	1	0	3
2.	BMA101	Mathematics – I	3	1	0	3
3.	BPH101	Engineering Physics - I	3	0	0	3
4.	BCH101	Engineering Chemistry – I	3	0	0	3
6.	BCS101	Fundamentals of Computing and Programming	3	0	0	3
7.	BBA101	Personality Development (Civil, Mechanical and Bio branches)	1	1	0	2
9.	BBT 102	Biology for Engineers (Civil & Mechanical branches)	2	0	0	2
10.	BCE101	Basic Civil Engineering (Mechanical & Bio Engineering Branches)	2	0	0	2
11.	BME101	Engineering Graphics – E (Civil, Mechanical, Aeronautical)	2	3	0	4
PRACTICAL						
16.	BCM1L1	Basic Civil and Mechanical Engineering Practices Laboratory	0	0	3	1
18.	BPC1L1	Physics and Chemistry Laboratory#	0	0	3/3	0
19.		NCC/NSS/ Yoga (Optional) to be conducted during week ends				
For a given program, Total Instruction Periods per Week = 35; Total Number of Credits = 26						

#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)

*Any one of the following courses: BFR201 – French, BGM201 – German, BJP201 – Japanese, BKR201 – Korean, BCN201 – Chinese, BTM201 – Tamil

SEMESTER II

SL. NO	COURE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	BEN201	English – II	3	1	0	3
2	BMA201	Engineering Mathematics – II	3	1	0	3
3	BPH201	Engineering physics – II	3	0	0	3
4	BCH201	Engineering Chemistry – II	3	0	0	3
5	BFI201#	Foreign/Indian Language (Circuit Branches)	3	0	0	3
7	BME202	Engineering Mechanics(Civil & Mechanical Branches)	3	1	0	3
8	BEE201*	Basics Electrical and Electronics Engineering (Civil, Mechanical & Bio Engineering Branches)	2	0	0	2
PRACTICAL						
9	BCS2L2	Computer Practices Lab (Civil, Mech & Bio)	0	0	3	1
10	BEE2L1*	Basics Electrical and Electronics Engineering Practices Laboratory (Civil, Mechanical and Bio Branches)	0	0	3	1
11	BPC2L1	Physics and Chemistry Laboratory	0	0	3/3	1
12		NCC/ NSS/Yoga (optional) to be conducted during week ends				

For a Given Program, the Total Instruction Periods per Week = 35; Total Number of Credits = 23

*Syllabus is same as that of first semester.

Any one of the following courses:BFR201 – French, BGM201 – German, BJP201 – Japanese, BKR201 – Korean, BCN201 – Chinese, BTM201 - Tamil□

SEMESTER III

Sub Code	Course Title	L	T	P	C
THEORY					
BMA301	Mathematics – III	3	1	0	4
BME301	Kinematics of Machines	3	1	0	4
BMT303	Electronic Devices and Electronic Circuits	3	1	0	4
BME302	Mechanics of Solids and Fundamentals of Fluids	3	1	0	4
BMT301	Digital Electronics	3	0	0	3
BMT302	Electrical Machines & Drives	3	0	0	3
PRACTICAL					
BMT3L1	Electronic Devices and Electronic Circuits - Lab	0	0	4	2
BMT3L2	Electrical Machines & Drives Lab	0	0	4	2
BMT3L3	Computer Aided Machine Drawing	0	0	4	2
Total No. of Contact Hours: 34				**Total No. of Credits: 28**	

SEMESTER IV

Sub Code	Course Title	L	T	P	C
THEORY					
BMA402	Numerical Methods	3	1	0	4
BME401	Dynamics of Machines	3	1	0	4
BMT401	Manufacturing Technology	3	0	0	3
BEE404	Power Electronics	3	0	0	3
BEI402	Control Systems	3	1	0	4
BCE406	Environmental Studies	3	0	0	3
PRACTICAL					
BMT4L1	Manufacturing Technology Lab	0	0	4	2
BMT4L2	Machine Dynamics Lab	0	0	4	2
BEE4L2	Power Electronics Lab	0	0	4	2
BMT4S1	Technical Seminar – I	0	0	3	1
Total No. of Contact Hours: 36				**Total No. of Credits: 28**	

SEMESTER V

Sub Code	Course Title	L	T	P	C
THEORY					
BMT501	Thermodynamics Principles and Applications	3	1	0	4
BEC501	Microprocessors & its Applications	3	0	0	3
BMT503	Instrumentation & Control	3	0	0	3
BMT502	CNC Technology	3	0	0	3
BMT504	Dimensional Metrology	3	0	0	3
BMT5E1	Elective – I	3	0	0	3
PRACTICAL					
BEC5L2	Microprocessors Lab	0	0	4	2
BMT5L1	Instrumentation and Control Lab	0	0	4	2
BMT5L2	CNC Lab	0	0	4	2
BMT5S1	Technical Seminar-II	0	0	3	1
Total No. of Contact Hours: 34				**Total No. of Credits: 26**	

SEMESTER VI

Sub Code	Course Title	L	T	P	C
THEORY					
BMT601	Sensors & Signal Processing	3	0	0	3
BMT602	Applied Hydraulics & Pneumatics	3	0	0	3
BEC611	Micro Controller & PLC	3	1	0	4
BMT603	Design of Mechatronics Systems	3	0	0	3
BME605	Computer Integrated Manufacturing	3	0	0	3
BMT6E2	Elective – II	3	0	0	3
PRACTICAL					
BMT6L1	Sensors & Signal Processing Lab	0	0	4	2
BEC6L6	Micro Controller & PLC Lab	0	0	4	2
BMT6L2	Hydraulics & Pneumatics Lab	0	0	4	2
BMT6S1	Technical Seminar-III	0	0	3	1
Total No. of Contact Hours: 34				**Total No. of Credits: 26**	

SEMESTER VII

Code No.	Course Title	L	T	P	C
THEORY					
BMT702	Simulation & Modeling for MT	3	0	0	3
BMT701	Robotics & Machine Vision System	3	0	0	3
BAM705	Automotive Electronics	3	0	0	3
BMA701	Operations Research for Engineers	3	1	0	4
BMT7E3	Elective – III	3	0	0	3
BMT7E4	Elective – IV	3	0	0	3
PRACTICAL					
BME7L3	CAD/CAM Lab	0	0	4	2
BMT7L3	Robotics Lab	0	0	4	2
BMT7P1	Mechatronics System Design & Fabrication Project	0	0	4	2
BMT7L4	Comprehension	0	0	3	1
BMT7V1	Inplant Training (End of VI Sem-15 days)	0	0	0	1
Total No. of Contact Hours: 34		**Total No. of Credits: 27**			

SEMESTER VIII

Code No.	Course Title	L	T	P	C
THEORY					
BMT8E5	Elective – V	3	0	0	3
BMT8E6	Elective – VI	3	0	0	3
BMT8E7	Elective – VII	3	0	0	3
PRACTICAL					
BMT8P1	Project Work & Viva Voce	0	0	18	6
Total No. of Contact Hours:30		**Total No. of Credits: 15**			

TOTAL NO.OF CREDITS: 199

LIST OF ELECTIVES

Code No.	Course Title	L	T	P	C
BMT002	Integrated Circuits	3	1	0	4
BCS001	C and Object Oriented Programming	3	1	0	3
BEC001	Neural Network & Fuzzy Logic	3	0	0	3
BMT001	Embedded System and Design	3	0	0	3
BMT801	Medical Mechatronics	3	0	0	3
BMT005	MEMS and Nano Technology	3	0	0	3
BMT003	Artificial Intelligence	3	0	0	3
BMT004	Virtual Instrumentation	3	0	0	3
BMT006	Consumer Electronics	3	0	0	3
BEC002	Digital Image Processing	3	0	0	3
BMT007	Micro Electronics and Nano Electronics	3	0	0	3
BBA051	Marketing Management	3	0	0	3
BBA052	Professional Ethics	3	0	0	3
BBA054	Indian Constitution and Society	3	0	0	3
BBA055	Engineering Economics and Cost Analysis	3	0	0	3
BBA056	Product Design and Costing	3	0	0	3
BBA057	Statistical Quality Control	3	0	0	3
BBA058	Entrepreneurship Development	3	0	0	3
BBA059	Professional Ethics and Human Values	3	0	0	3
BBA060	Principles of Management And Organizational Behavior	3	0	0	3
BBA061	Total Quality Management and Reliability Engineering	3	0	0	3

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

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

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

Course outcomes:

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

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

Course Assessment Method

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

UNIT I **9+3**

Parts of speech - Active and passive voices - Subject verb agreement - Writing about School life, Hobbies, Family and friends – Word formation with prefixes and suffixes - Tenses - Concord - Summarizing - Note-making

UNIT II **9+3**

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

UNIT III **9+3**

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

UNIT IV **9+3**

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

UNIT V **9+3**

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

TOTAL NO OF PERIODS: 60

Text Book:

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

Reference:

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

BMA 101 ENGINEERING MATHEMATICS – I **3 1 0 3**

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

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

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

- ❖ Formulate a mathematical model for three dimensional objects and solve the concerning problems.

- ❖ Find area and volume based on a function with one or more variables.

Course outcomes:

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

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

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

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

Course Assessment Method

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

UNIT-1 Matrices **9+3**

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

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

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

UNIT-III Differential Calculus

9+3

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

UNIT-1V Functions of Several Variables

9+3

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

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

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

Total : 60 Periods

TEXT BOOK:

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

REFERENCES:

1. Ramana**.B.V. "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi,** 2007.
2. **Glyn James, "Advanced Engineering Mathematics", 7**th Edition, Pearson Education, 2007.
3. Erwin Kreyszig, **"Advanced Engineering Mathematics",** 8th Edition, John Wi;ey and Sons,New York, 2003.
4. **Murray R.Spiegel, "Advanced Calculus", Schaum's Outline Series,** First Edn, McGraw Hill Intl Book Co.,New Delhi, , 1981.

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

Objectives

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

COURSE OUTCOMES

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

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

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

Course Assessment Method

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

UNIT-I Ultrasonics **9**

Introduction – Production- Magnetostriction Effect- Magnetostriction Generator- Piezoelectric Effect- Piezo electric generator- Detection of ultrasonic waves- Properties- Cavitation- Acoustic grating -Industrial applications-Drilling, Welding, Soldering, Cleaning and SONAR- Velocity measurement- - Non-Destructive Testing (NDT) – Pulse-Echo

System through transmission and reflection modes- A, B And C Scan Display methods- Important medical applications- Sonogram--problem.

UNIT-II LASER **9**

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

UNIT-III Quantum Physics **9**

Drawbacks with classical physics- Blackbody radiation: Max Planck theory and concept of energy quantization, **deduction of Wien's displacement law, Raleigh**-Jeans law **–** Matter waves- de Broglie wave length-photoelectric effect**–** Schrödinger equation (time-independent, and time-dependent equations)- wave functions and energy spectrum-application to particle in box-problem.

UNIT – IV Electromagnetic Theory **9**

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

Unit-V Crystal Physics **9**

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

Total: 45 Periods

Text Books

1. Sears.F.W.,Zemansky.M.W., **Young.H.D,;'University Physics; Narosa Publishing House.**

2. Avadhanulu. M.N.; Engineering Physics-Vol-1; S.Chand And Company Ltd, 2010.

Reference Books

1. **Rajendran.V, And Marikani . A, 'Engineering Physics' Tata Mcgrow ?Hil Publications Ltd, 3**rd Edition, New Delhi(2004).

2. **Sears.,Zemansky.,, Young.;'College Physics; Addison Wesley Publishing Company.**
3. **Mukundan. A, Usha.S.,Lakshmi.V; 'Engineering Physics' Scitech Publications (India) Pvt.Ltd., Chennai, 2006.**

4. Resnick, R., and Halliday, D. and Walker, J.; Fundamental of Physics; John Wiley and Sons.

BCH 101 ENGINEERING CHEMISTRY – I 3 0 0 3

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

Course Objectives:

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

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

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

Course outcomes:

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

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

Course Assessment Method

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

UNIT I Water Technology **9**

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

UNIT II Polymer 9

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

UNIT III Electro chemistry **9**

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

UNIT IV Corrosion and Corrosion Control 9

Introduction: Chemical corrosion Definition - Chemical Corrosion - Electrochemical corrosion – different types – galvanic corrosion – differential aeration corrosion – mechanism of Chemical and Electrochemical corrosion factors influencing corrosion Corrosion control – sacrificial anode and impressed cathodic current methods – Protective coatings :Paints– constituents of the paint and their functions Metallic coatings – electroplating of Gold and electroless plating of Nickel.

UNIT V Non-Conventional Energy Sources and Storage Devices 9

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

TOTAL: 45 PERIODS

TEXT BOOKS:

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

REFERENCES:

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

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

Course Objectives:

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

Course Outcome:

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

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

Course Assessment Method

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

UNIT I: Introduction to Computer 9

Introduction-Characteristics of computer-Evolution of Computers-Computer Generations - Classification of Computers-Basic Computer Organization-Number system. Computer Software: Types of Software—System software-Application software-Software Development Steps

UNIT II: Problem Solving and Office Automation 9

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

UNIT III: Introduction to C 9

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

UNIT IV: Arrays and Structures 9

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

UNIT V: Introduction to C++ 9

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

Total: 45 Periods

Text books:

1. Ashok, N.Kamthane,**"Computer Programming", Pearson Education (2012).**
2. **Anita Goel and Ajay Mittal,"Computer Fundamentals and Programming in C", Dorling Kindersley**
   (India Pvt Ltd).,Pearson Education in South Asia,(2011).
3. **Yashavant P. Kanetkar, "Let us C",13thEdition,BPB Public**ations(2013).
4. **Yashavant P. Kanetkar,"Let us C++"10th Edition, BPB Publications (2013).**

References:

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

BBA101/BBA102 Personality Development 1 1 0 2

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

Instructional Objectives:

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

Course Outcomes:

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

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

Course Assessment Method

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

Quiz	Alumni
Online Test	
End Semester Examination	

UNIT I Introduction to Personality Development **9**

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

UNIT II Attitude & Motivation **9**

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

Unit III Self-esteem **9**

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

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

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

Unit V Employability Quotient **9**

Resume building- The art of participating in Group Discussion **–** Acing the Personal (HR & Technical) Interview -Frequently Asked Questions - Psychometric Analysis - Mock Interview Sessions.

Total: 45 Periods

Text Books:

1. Hurlock, E.B (2006). Personality Development, 28th Reprint. New Delhi: Tata McGraw Hill.

2. Stephen P. Robbins and Timothy A. Judge(2014), *Organizational Behavior 16th Edition:*PrenticeHall.

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 2 0 0 2

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

Course Objectives:

The Students will be able to

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

Course Outcomes:

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

CO2: Able to apply biological concept in real life situation.
CO3: Will have the basic knowledge in application of biological system in relevant industries.

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

Course Assessment Method

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

UNIT-I Introduction to Life **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 **lawsof 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, hypertention, influenza, AIDS and Hepatitis

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

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

Total: 45 Periods

Text Books:

1. A Text book of Biotechnology, R.C.Dubey, S. Chand Higher Academic Publications, 2013

2. Diseases of the Human Body, Carol D. Tamparo and Marcia A. Lewis, F.A. Davis Company, 2011

3. Biomedical instrumentation, Technology and applications, R. Khandpur, McGraw Hill Professional, 2004

Reference Books

1. Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011

2. Cell Biology and Genetics (Biology: The unity and diversity of life Volume I), Cecie Starr, Ralph Taggart, Christine Evers and Lisa Starr, Cengage Learning, 2008

3. Biotechnology Expanding horizon, B.D. Singh, Kalyani Publishers, 2012

BCE 101/BCE 201 BASIC CIVIL ENGINEERING LTPC **2 0 0 2**

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

- To expose students with the basics of Civil Engineering
- To understand the components of a building
- To Learn Engineering aspects related to dams, water supply, and sewage disposal

Course objective:

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

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

Course Assessment Method

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

UNIT- I Civil Engineering Materials **8**

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

UNIT- II Surveying **5**

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

UNIT- 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- VMiscellaneous Topics **5**

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

TOTAL : 30 PERIODS

Text Books:

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

Reference Books:

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

BME 101 ENGINEERING GRAPHICS- E 2 0 3 4

Aim

To develop graphical skills in students for communication of concepts, design ideas

of engineering products and expose them to existing standards related to technical drawings.

Objectives

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

Course Outcomes:

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

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

Course Assessment Method

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

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

Conics-construction of ellipse, parabola and hyperbola by eccentricity method-construction of cycloids- construction of involutes of square and circle-Drawing of tangent and normal to the above curves-Scales-Basic drawing conventions and standards-Orthographic projection principles- Principal planes-First angle projection- Projection of points. Projection of straight lines (only first angle projections) inclined to both the principal planes-Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces.

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

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

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

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

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

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

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

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

Total: 60 Periods

Text Books:

1. **N.D.Bhatt and V.M.Panchal, "Engineering drawing", charotar publishing house, 50**th edition, 2010.

2. **K.V.Natarajan "A Text book of Engineering Graphics",Dhanalakshmi Publishers, Chennai, 2009.**

References:

1. **K.R.Gopalakrishna, "Engineering drawing",(Vol-**I & II combined)Subhas stores, Bangalore,2007.
2. **K.Venugopal and V. PrabhuRaja, "Engineering Graphics",New age International Private limited,2008.**
3. **Luzzader, Warren.J., and Duff, John.M.,, "Fundamental**s of Engineering Drawing with an introduction to**Interactive computer graphics for design and production", Eastern economy edition,Prentice Hall of India Pvt**Ltd,New Delhi,2005.

Special points applicable to University Examinations on Engineering Graphics

1) There will be five questions, each of either or type covering all units of the syllabus.

2) All questions will carry equal marks of 20 each making a total of 100.

BCM1L1/ BCM2L1 BASIC CIVIL & MECHANICALENGINEERING PRACTICES LABORATORY 0 0 2 1

Aim

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

Objectives

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

2. To expose the students regarding pipe connection for pumps & turbines and to study the joint used in roofs, doors, windows and furnitures.

3. To provide hands on exercise on basic welding, machining and sheet metal works.

4. To provide exposure regarding smithy, foundry operations and in latest welding operations such as TIG, MIG, CO2, spot welding etc.,

5. To expose the students regarding the construction and working of centrifugal pump, air-conditioner and lathe.

Practical

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

I. CIVIL ENGINEERING PRACTICE

Buildings:

Study of plumbing and carpentry components of residential and industrial buildings.Safety aspects.

Plumbing Works:

a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household 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 connectionof 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 MECHANICAL ENGINEERING PRACTICE

Welding: 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.

Machine assembly practice:

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

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

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

Demonstration:

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

REFERENCES:

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

BEN 201 ENGLISH II **3 1 0 3**

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

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

Course outcomes:

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

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

Course Assessment Method

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

UNIT I Orientation 9 + 3

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

UNIT II Oral Skill 9 + 3

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

Comprehension answering questions. Inferring meaning.

UNIT III Thinking Skill **9+3**

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

UNIT IV Writing Skill **9 + 3**

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

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

UNIT V Formal Information **9 + 3**

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

Total: 60 Periods

TEXT BOOK:

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

REFERENCE BOOKS:

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

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

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

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

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

Course Objectives:

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

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

Course outcome:

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

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

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

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

Course Assessment Method

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

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

Higher order linear differential equations with constant coefficients - Method of variation of

parameters **– Cauchy's** and L**egendre's linear equations** - simultaneous first order linear equations with constant coefficients.

UNIT II Vector Calculus **9+3**

Gradient, divergence and curl **–**Directional derivatives **–**Irrotational and solenoid vector fields **–** vector integration

– Green's theorem in a plane, Gauss divergence theorem and S**toke's theorem (**without proofs) **–** simple applications involving cubes and rectangular parallelepipeds.

UNIT III Analytic Functions **9+3**

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

UNIT IV Complex Integration **9+3**

Complex integration **– Statement and application of Cauchy's integral theorem and Cauchy's integral formula –**

Taylor and Laurent expansions **–** Singular points **–** Residues **–** Residue theorem **–**Application of Residue theorem to evaluate real integrals **–** Unit circle and semi-circular contour (excluding ploes on boundaries).

UNIT VStatistics **9+3**

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

Total : 60 Periods

TEXT BOOK :

1. **1 .R.M.Kannan and B.Vijayakumar" Engineering Mathematics – II " 2**nd Edition , SRB Publication ,Chennai 2007.

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

REFERENCES :

1. **Ramana.B.V , " Higher Engineering Mathematics " , Tata McGraw Hill Publishing Company , New Delhi,** 2007.

2. **Gupta SC, and VK.Kapoor, "Fundamentals Mathematical Statistics",** 11th edition, Sultan Chand Sons, ,New Delhi, 2014.

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

Objectives

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

Course outcomes

CO1 - To Know about properties and advancements of conducting materials .

CO2 – To know the principle and properties semiconducting materials.

CO3 - Acquire Knowledge on magnetic and dielectric materials

CO4 – To Know about the creation of new materials with novel properties

CO5 – To understand the impact of light in technical uses

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

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

Course Assessment Method

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

Seminar	Industry
Quiz	Alumni
Online Test	
End Semester Examination	

UNIT – I Conducting Materials **9**

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

UNIT – II Semiconducting Materials **9**

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

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

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

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UNIT- IV New Engineering Material **9**

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

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

Light Interaction With Solids- Classification of Optical Material – Optical Properties of Metals, Insulator And Semiconductors – Traps –Colour Centers – Luminescence – phosphorescence – LED – LCD – Construction and Working – Advantages and Disadvantages – Applications.

Principle and Propagation of Light In Optical Fibers - Numerical Aperture And Acceptance Angle- Types Optical Fibers (Material, Refractive Index, Mode based) - Double Crucible Technique of Fiber Drawing.

Total: 45Periods

TEXT BOOKS

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

REFERENCE BOOKS

1. Material science by r.suresh, v. jayakumar–lakshmi publications; arapakkam (2006).

2. Material science by Dr. P. K. Palanisamy–Scietech publications (india) Pvt Ltd, chennai (2006).
3. **Rajendran V and Marikani a, 'material science' tatamcgraw hill publications Ltd, 3**rdedition , new delhi(2004).

4. **M.Arumugam, 'material science', anuradha publications, kumbakonam (2006).**

BCH 201 ENGINEERING CHEMISTRY – II **3 0 0 3**

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

Course Objectives:

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

importance

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

Course outcomes:

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

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

Course Assessment Method

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

UNIT I - Surface Chemistry **9**

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

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

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

UNIT III - Analytical Techniques **9**

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

UNIT IV - Fuels **9**

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

UNIT V Engineering Materials **9**

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

TOTAL: 45 PERIODS

TEXT BOOKS:

1. **P.C.Jain and Monica Jain, "Engineering Chemistry" DhanpatRai**Pub, Co., New Delhi (2002).

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

REFERENCES:

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

BFR 101 / 201 FRENCH **3 0 0 3**

Importance of the Course:

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

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

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

Course Objective

The Basic Course in French is designed to :

1. Introduce the basics of the language to beginners

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

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

Course Objective:

CO1: Will have a basic knowledge on Foreign Languages, foreign culture and heritage.

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

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

Course Assessment Method

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

UNIT – I: **9**

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

UNIT – II **9**

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

UNIT – III **9**

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

possessive and interrogative adjectives

UNIT – IV **9**

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

UNIT – V **5**

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

UNIT – VI **4**

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: possessiveadjectives, exclamative adjectives, imperative tense

Total: 45 hours

REFERENCES:

- Course Material: Synchronie I –Méthode de Français

- Madanagobalane -Samita Publications, Chennai, 2007

BGM 101/ 201 GERMAN **3 0 0 3**

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

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

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

Course Objective :

CO1: Will have a basic knowledge on Foreign Languages, foreign culture and heritage.
CO2: Will able to read and write a foreign language.

CO3: Will get sufficient exposure for developing basic conversational skills.
CO4: Will impart knowledge on foreigh lifestyle.
CO5: Will gain confidence to survive in global environment.

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

Course Assessment Method

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

Course structure:

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

UNIT I **9**

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

UNIT II **9**

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

UNIT III **9**

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

UNIT IV **9**

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

UNIT V **9**

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

TOTAL 45 hours

Resources:

- Sprachkurs Deutsch 1 (VerlagDiesterweg), New Delhi Learning Centre

BJP 101/201 JAPANESE **3 0 0 3**

Course Objective:

The student will be able

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

Course Objective :

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

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

CO4	S		M	W								
CO5		W	W									

Course Assessment Method

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

UNIT I **9**

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

UNIT II **9**

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

UNIT III **9**

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

UNIT IV **9**

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

UNIT V **9**

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

Total: 45 Periods

Text books

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

Reference Books

1. Japanese Reader collection Volume I, YumiBoutwell and Clay Boutwell, Kotoba books, 2013
2. Living language Japanese Complete edition begineers through advanced course, Living language, 2012

BKR 101/201 KOREAN **3 0 0 3**

Course Objective:

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

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

Course Outcome:

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

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

Course Objective :

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

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

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

Course Assessment Method

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

UNIT I **9**

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

UNIT II **9**

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

UNIT III **9**

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

UNIT IV **9**

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

UNIT V **9**

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

Total: 45 Periods

Course Material:

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

BCN 101/201 CHINESE **3 0 0 3**

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

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

Course Objective :

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

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

Course Assessment Method

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

UNIT-1 **9**

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

UNIT-II **9**

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

3.Nomenclature

UNIT-III **9**

Chinese characters, Homophones, Phonology

UNIT-IV **9**

Tones, Phonetic transcriptions, Romanization, Other phonetic transcriptions

UNIT-V **9**

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

Total: 45 Periods

REFERENCES:

- Hannas, William C. (1997), *Asia's Orthographic Dilemma*, University of Hawaii Press, ISBNHYPERLINK "http://en.wikipedia.org/wiki/Special:BookSources/978-0-8248-1892-0" 978-0-8248-1892-0.
- Qiu, Xigui (2000), *Chinese Writing*, trans. Gilbert Louis Mattos and Jerry Norman,Society for the Study of Early China and Institute of East Asian Studies, University of California,Berkeley, ISBNHYPERLINK "http://en.wikipedia.org/wiki/Special:BookSources/978-1-55729-071-7" 978-1-55729-071-7.
- Ramsey, S. Robert (1987), *The Languages of China*, Princeton University Press,ISBNHYPERLINK "http://en.wikipedia.org/wiki/Special:BookSources/978-0-691-01468-5" 978-0-691-01468-5.
- Schuessler, Axel (2007), *ABC Etymological Dictionary of Old Chinese*, Honolulu: University of Hawaii Press, ISBNHYPERLINK "http://en.wikipedia.org/wiki/Special:BookSources/978-0-8248-2975-9" 978-0-8248-2975-9.
- R. L. G. "Language borrowing Why so little Chinese in English?" *The Economist*.June 6, 2013.

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

Objective:

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

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

- ❖ The laws and kinematics of motion of particles and rigid bodies

Course outcomes

CO1: Students will gain knowledge regarding the various laws and principles associated with statics and dynamics statics and to apply them for practical solutions.

CO2: Students will gain knowledge regarding center of gravity and momenta inertia and apply them for practical problems.

CO3: Students will gain knowledge regarding various types of forces and reactions and tom draw free body diagram to quicker solutions for complicated problems.

CO4: Student will gain knowledge in work and energy

CO5: Student will gain knowledge on friction on equilibrium and its application.

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

Course Assessment Method

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

UNIT – I Basics and Statics Of Particles 12

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

UNIT – II Equilibrium of Rigid Bodies 10

Free body diagram **–** Types of supports and their reactions **–** requirements of stable equilibrium **–** Moments and Couples **–** Moment of a force about a point and about an axis **–** Vectorial

representation of moments and couples – Scalar components of a moment – **Varignon's theorem** - Equilibrium of Rigid bodies in two dimensions -Equilibrium of Rigid bodies in three dimensions.

UNIT – III Properties of Surfaces and Solids 10

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

UNIT – IV Friction 10

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

UNIT – V Dynamics Of Particles 10

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

TEXT BOOK:

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

REFERENCES :

1. Kumar, K. L Kumar, V., Engineering Mechanics, Tata McGraw – Hill, New Delhi, 2010

2. Palanichamy, M.S., Nagan, S., Engineering Mechanics – Statics & Dynamics, Tata McGraw - Hill, 2013.

3. Timoshenko, and Young, Engineering Mechanics, Tata McGraw-Hill, New Delhi, 2013.

4. Irving H. Shames, Engineering Mechanics – Statics and Dynamics, IV Edition – Pearson Education Asia Pvt., Ltd., 2006.

BEE 201 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING 2 0 0 2

UNIT – I D.C. AND A.C 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 –T**hevenin's and Norton's Theorem** - Problems.

UNIT – II ELECTRICAL MACHINES **6**

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

UNIT – III BASIC MEASURMENT SYSTEMS **6**

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

UNIT IV – SEMICONDUCTOR DEVICES **6**

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

UNIT V – DIGITAL ELECTRONICS **6**

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

TOTAL NO. OF PERIODS: 30

TEXT BOOKS:

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

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

McGraw Hill

REFERENCE BOOKS:

1. Edminister J.A. ***"Theory and problems of Electric Circuits"*** **Schaum's Outline Series. McGraw**

   Hill Book Compay, 2nd Edition, 1983.
2. Hyatt W.H and K**emmerlay J.E. "***Engineering Circuit Analysis***", McGraw Hill Internatinal**Editions, 1993.

3. D. P. Kothari and I. J. Nagrath**"** Electric machine**s"Tata McGraw**-Hill Education, 2004

4. **Millman and Halkias, "Integrated Electronics", Tata McGraw Hill Edition,2004.**

BCS 1L1/BCS 2L2 COMPUTER PRACTICE LABORATORY I 0 0 2 1

LIST OF EXERCISES

Practical

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

A) Word Processing 11

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

B) Spread sheet 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 10

13. Classes and Objects

14. Constructor and Destructor

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

Total: 45 Periods

BEE2L1 Basic Electrical Engineering Lab 0 0 2/2 1

Practical

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

I - List of Experiments for Electrical Engineering Lab

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

I - List of Experiments for Electronics Engineering Lab

1. Study of electronic components and equipments.
    A. Resistor colour coding using digital multi-meter.
    B. Assembling electronic components on bread board.
2. Measurement of ac signal parameters using cathode ray oscilloscope and function generator.
3. Soldering and desoldering practice.
4. Verification of logic gates (OR, AND, OR, NOT, NAND, EX-OR).
5. Implementation of half adder circuit using logic gates.

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

Practical

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

I - LIST OF EXPERIMENTS – PHYSICS

1. Determination of resistivity of high resistance alloys and temperature coefficient
2. Study of Hall effect – Hall coefficient determination
3. Determination of electrical conductivity of good conductors
4. Study of magnetic hysteresis and energy product
5. Determination of Band gap of a semiconductor
6. Determination of Dispersive power of a prism – Spectrometer

II - LIST OF EXPERIMENTS – CHEMISTRY

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

BMA301 MATHEMATICS – III

L	T	P	C
3	1	0	4

OBJECTIVE:

- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- 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
- To develop Z transform techniques for discrete time systems.

Course Outcomes

CO01 - To learn the problem solving methods in linear differential equations
CO02 - To learn Dirichlet's condition and operations using Fourier series
CO03 - To have a clear understanding about 2nd order equations and wave equations
CO04 – Properties of Laplace transform and problem solving using it
CO05 - Properties of Fourier transform and problem solving using it

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		W	S		M							
CO3		M		S								
CO4	S		M	W								

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey

2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz		
4	Online test	4	Alumni
5	End Semester Examinations		

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 12

Formation-solutions of standard types of first order equations-LaGrange's equation-linear partial differential equations of second and higher order with constant coefficients.

UNIT II FOURIER SERIES 12

Dirichlet's condition-General Fourier series-half range sine and cosine series-Parseval's identity. Harmonic Analysis.

UNIT III BOUNDARY VALUE PROBLEMS 12

Classification of second order linear partial differential equations-Solutions of one- Dimensional wave equations, one-dimensional heat equations.

UNIT IV LAPLACE TRANSFORMS 12

Transforms of simple functions-basic operational properties-transforms of derivatives and integrals-Initial and Final value theorems-Inverse transforms-Convolution theorem. Periodic functions. Applications of Laplace Transforms for solving linear ordinary differential equations up to second order with constant coefficients and integral equations.

UNIT V FOURIER TRANSFORMS 12

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

TOTAL NO. OF PERIODS: 60

Text Books:

1. *Kreyszig, E."Advanced Engineering Mathematics"8th Edition, John Wiley and Sons, (Asia) Pvt., Ltd, Singapore, 2006.*
2. *Grewal, B.S.,"Higher Engineering Mathematics" (35thEdition), Khanna Publishers, Delhi2000.*

References:

1. *Kandasamy, P., Thilakavathy, K., and Gunavathy,Kk. "Engineering Mathematics", Volumes 1 and 3(4th Edition) S Chand and Co., New.*
2. *Narayanan, S.ManicavachangamPillay, T.K.Ramanaiah, G."Advanced mathematics for Engineering Students", Volume2 and 3(2nd Edition), S.Viswanathan (printers & publishers Pte, 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.htm.*

BME301 KINEMATICS OF MACHINES 3 1 0 4

OBJECTIVE:

1. To understand the basic components and layout of linkages in the assembly of a system / machine.

2. To understand the principles in analyzing the assembly with respect to the displacement, velocity, and acceleration at any point in a link of a mechanism.

3. To understand the motion resulting from a specified set of linkages, design few linkage mechanisms and cam mechanisms for specified output motions.

4. To understand the basic concepts of toothed gearing and kinematics of gear trains and the effects of friction in motion transmission and in machine components.

Course Outcomes

CO01 – Upon completion of this course, the students can able to apply fundamentals of mechanism for the design of new mechanisms and analyse them for optimum design

CO02 - Will know the impact of numerical methods in engineering analysis

CO03 - Better understanding on the theoretical background of mechanisms

CO04 - Will get the confidence in using mechanisms

CO05 - Capability of solving engineering problems will increased

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	M	W	S	W	W						M	M
CO2	W			M	M					M		M
CO3	M	M	W	M	M		M				M	
CO4	M		W							W		M
CO05	S		M		M						W	

Course Assessment Methods:

Direct		**Indirect**	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

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 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, Gyroscopic effects in grinding machines.

TOTAL NO. OF PERIODS: 60

Text Books:

1. *S.S.Rattan-Theory of Machines- Tata McGraw Hill, 3rd Edition, 2009.*
2. *Bansal- Theory of Machines, 2006.*

References:

1. *Shigley.J.E-Theory of Machines and Mechanisms, 2nd Edition- McGraw Hill Inc,1995*
2. *V.P.Singh-Theory of Machines ,2001*
3. *Rao J.S. & Dukkipatti R.V.Mechanisms and Machine Theory, 2nd Edition-Wiley Estern Ltd-1992.*

BMT303 ELECTRONIC DEVICES AND ELECTRONIC CIRCUITS 3 1 0 4

OBJECTIVES:

- To understand the basics of electrical engineering and transformers.
- To understand the Constructions and working details of RC,RL and RLC circuits Q factor.
- To understand the semiconductor diodes and special diodes.
- To understand the basic concepts of Oscillators and Multi-vibrators.
- To understand the working principle of Rectifiers and power supplies.

COURSE OUTCOMES

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

CO1: Able to get the basic knowledge about the Electric and Magnetic circuits, Network Theorems.

CO2: Able to get the knowledge about the construction and working of **RC, RL and RLC circuits**.

CO3: Able to get the knowledge about the semiconductor diodes and special diodes.

CO4: Able to get the basic concepts of Oscillators and Multi-vibrators

CO5: To understand the working principle of Rectifiers and power supplies.

CO/PO Mapping

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

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S				M		S	S		S	
CO2	S		M	S	M	W	M			M		
CO3							M	M	S			
CO4		M	S	M			W				S	M
CO5	S				S	M			M	S		S

COURSE ASSESSMENT METHODS

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I CIRCUIT ANALYSIS TECHNIQUES 12

Kirchoff's current and voltage laws – series and parallel connection of independent sources – R, L and C – Network Theorems – Thevenin, Superposition, Norton, Maximum power transfer and duality – Star-delta conversion.

UNIT II TRANSIENT RESONANCE IN RLC CIRCUITS 12

Basic RL, RC and RLC circuits and their responses to pulse and sinusoidal inputs –frequency response – Parallel and series resonances – Q factor – single tuned and double tuned circuits.

UNIT III SEMICONDUCTOR DIODES AND SPECIAL DEVICES 12

SEMICONDUCTOR DIODES: Review of intrinsic & extrinsic semiconductors – Theory of PN junction diode – Energy band structure – current equation – space charge and diffusion capacitances – effect of temperature and breakdown mechanism – Zener diode and its characteristics.

SPECIAL DIODES : Tunnel diodes – PIN diode, varactor diode — UJT – Diac and Triac –

Laser, CCD, Photodiode, Phototransistor, Photoconductive and Photovoltaic cells – LED, LCD.

UNIT IV OSCILLATORS AND MULTIVIBRATORS 12

Oscillators: Classification of oscillators – Barkhausen criterion operation and analysis of RC phase shift, Wien's bridge, Hartely, colpitts oscillators.

Multivibrators: Astable, monostable and bistable – Analysis of performance parameters of multivibrators using 68ehavio Trigger – Blocking oscillators.

UNIT V RECTIFIERS AND POWER SUPPLIES 12

Single –phase, half-wave and full-wave rectifiers – Bridge rectifiers – Ripple factor, rectification efficiency-Transformer Utilisation Factor and regulation – Performance characteristics of rectifiers with filters – Regulated power supply – Series and shunt type voltage regulators – Switched mode power supplies.

TOTAL : 60 PERIODS

TEXT BOOKS

1. Joseph A. Edminister, Mahmood, Nahri, "Electric Circuits" – Shaum series,Tata McGraw Hill, (2001)

2. S. Salivahanan, N. Suresh kumar and A. Vallavanraj, "Electronic Devices and Circuits",Tata McGraw Hill, 2nd Edition, (2008).

3. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 5th Edition, (2008).

REFERENCES

1. Robert T. Paynter, "Introducing Electronics Devices and Circuits", Pearson Education, 7th Education, (2006).

2. William H. Hayt, J.V. Jack, E. Kemmebly and steven M. Durbin, "Engineering Circuit Analysis",Tata McGraw Hill, 6th Edition, 2002.

3. J. Millman & Halkins, Satyebranta Jit, "Electronic Devices & Circuits",Tata McGraw Hill, 2nd Edition, 2008.

BME302 MECHANICS OF SOLIDS AND FUNDAMENTALS OF FLUIDS 3 1 0 4

OBJECTIVE:

- To learn fundamental concepts of Stress, Strain and deformation of solids with applications to bars, beams and thin cylinders.
- To know the mechanism of load transfer in beams, the induced stress resultants and deformations.
- To understand the effect of torsion on shafts and springs.
- To analyze a complex two dimensional state of stress and plane trusses.
- To analyze the fluid characteristics'

Course Outcomes

CO01 - textbook and auxiliary handout reading assignments

CO02 – To understand the different types of beams and bending moment and shear force

CO03 – To learn the power transmission and strain energy and stiffness and buckling

CO04 – To learn the flow characteristic fluid continuity, Euler's equation

CO05 - To learn the principles of dimensional analysis

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	M			S	S							
CO2					S							
CO3		M		S	S							
CO4				M	S							

Course Assessment Methods:

Direct		**Indirect**	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 12

Concept of stress-strain- Hooke's law- Tension- Compression and shear- Stress strain diagram, poisson's relation-Volumetric strain- Elastic constants and their relation- Stress in simple and composite bars subjected to axial loading and temperature- State of stress at a point-Principle plane- Principle stress-Normal and longitudinal stresses on a given plane-Mohr's circle of stresses.

UNIT II TRANSVERSE LOADING ON BEAMS, SHEAR FORCE AND BENDING MOMENT 12

Types of Beams- Transverse loading on beams shear force and Bending moment in beams – Cantilever- Simply supported, overhanging beam subjected to concentrated load and UDL – Maximum bending moment and point of contra flexure-Theory of simple bending and assumption – Derivation of formulae M/I = F/Y = E/R and its applications to engineering – Leaf spring.

UNIT III TORSION, SPRINGS AND COLUMNS 12

Theory of torsion and assumption – Torsion of circular shafts- solid & hollow – strain energy in torsion- Power transmission- Strength and stiffness of shafts- Types of springs- Stiffness stresses and deflection in helical spring- Columns – Buckling and stiffness due to axial loads – Euler, Rankin and Empirical formulae for columns with different conditions.

UNIT IV FLUID FLOW CONCEPTS AND DYNAMICS OF FLUIDS 12

Flow characteristics- Concepts of system and control volume –Continuity equation – Application of control volume to continuity – Energy Equation – Euler's Equation – Bernoulli equation and Momentum Equation – simple problems.

UNIT V DIMENSIONAL ANALYSIS AND FLOW THROUGH CIRCULAR CONDUITS 12

Dimension and units, Buckingham's Π theorem- Boundary layer concepts- Boundary layer thickness- Darcy-Weisbach equation- Friction factor and Moody diagram-Commercial pipes- Minor losses- Flow though pipes in series and in parallel.

TOTAL NO. OF PERIODS: 60

TEXT BOOKS

1. Ramamurtham.S and Narayanan.R, "Strength of material", Dhanpat Rai Pvt. Ltd., New Delhi, 2001.
2. Bansal.R.K, "Strength of Material", Lakshmi publications Pvt. Ltd., New Delhi, 1996.
3. Kumar.K.L, "Engineering Fluid Mechanics", Eurasla publishers Home Ltd., New Delhi, 1995.
4. Bansal.R.K, "Fluid Mechanics and Hydraulic Machines" , Laxmi publications (P) Ltd., New Delhi, 1995.
5. Popov.E.P, "Mechanics of Materials", Prentice Hall, 1982.
6. Timoshenko.S.P and Gere .M.J, "Mechanics of Materials", C.B.S. publishers, 1986.

REFERENCES

1. Ferdinand P. Beer and Russell Johnston.E, "Mechanics of Materials", SI metric Edition McGraw Hill, 1992
2. Srinath.L.N, "Advanced Mechanics of Solids",Tata McGraw Hill Ltd., New Delhi.
3. Ramamurthan.S, "Fluid Mechanics and Hydraulics", Dhanpat Rai and Sons, Delhi, 1988.
4. Fox R.W and Mc. Donald .A.T, "Introduction to fluid Mechanics", 5th Ed. John Wiley and Sons, 1999.

BMT301 DIGITAL ELECTRONICS 3 0 0 3

OBJECTIVE:

- To introduce the Number systems and logic gates.
- To acquaint the student with various application of digital systems used in electronics engineering.
- To know the knowledge about the different circuits.
- To get the knowledge about various circuits and counters.

Course Outcomes

CO01 - To learn different types logic gates
CO02 – To understand the different types of combinational circuits
CO03 – To learn the sequential circuits and flip-flops.
CO04 – To learn the Asynchronous sequential circuits.
CO05 - To learn the Algorithmic state machines.

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

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

Course Assessment Methods:

Direct		**Indirect**	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I NUMBER SYSTEM AND BASIC LOGIC 10

Number systems-Binary, Octal, Hexadecimal, BCD, excess 3, complements conversions and arithmetic. Boolean theorems, Boolean algebra – AND, OR, NOT NAND & NOR operation, sum of product and product of sum forms. Minimization – Karnaugh's map, tabular minimization procedures.

UNIT II COMBINATIONAL CIRCUITS 10

Problem formulation and design of combinational circuits, adder / substractor, Encoder / decoder MUX/DEMUX, comparator, code converter. Design of combinational circuits, ROM, EPROM, EEPROM, introduction to PAL and PLA and their use in design.

UNIT III SEQUENTIAL CIRCUITS 10

Sequential circuits – SR, JK, D, T flip flops, triggering analysis of clocked sequential circuits, ripple counter, synchronous counters. Registers – shift registers, serial to parallel, parallel to serial conversions. Timing signal, RAM, semiconductor memories.

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS 8

Stable unstable states, output specifications, cycles and races, Race free assignments, reduction of state and flor tables, hazards, pulse mode sequential circuits.

UNIT V ALGORITHMIC STATE MACHINES 7

ASM chart-timing considerations-control implementation-design with multiplexers and PLA.

TOTAL NO. OF PERIODS: 45

Text books:

1. Morris Mano M., "Digital Circuits and Logic Design", Prentice Hall of India, II Edition, 1996.

References:

1. W.H.Gothmann, "Digital Electronics-Introduction Theory and Practice", PHI, 1992.2nd Edition.

2. T.L.Floyd, "Digital Fundamentals", PHI, 1986.10th Edition.
3. S.C.Lee, "Digital Circuits and Logic Design", PHI, 2000.
4. R.R. Jain, "Modern digital electronics", 4th edition, Tata McGraw-Hill, 3rd edition 2003.
5. Leach and Malvino, "Digital Principles of Electronics & Applications", Tata McGraw-Hill, 5th Edition, 2003.

BMT302 ELECTRICAL MACHINES & DRIVES 3 0 0 3

OBJECTIVES:

- To understand the basics of electrical engineering and transformers.
- To understand the Constructions and working details of DC, AC motors and Special machines
- To understand the Speed control & Starting methods of DC &AC motors
- To understand the basic concepts of Drives , Electric drives, types and factors influencing the choice of electrical drives
- To understand the working principle of DC &AC motors drives and their characteristics and its braking methods

COURSE OUTCOMES

CO1: Able to get the basic knowledge about the Electric and Magnetic circuits, AC fundamentals and transformers.

CO2: Able to get the knowledge about the construction and working of DC, AC and Special machines.

CO3: Able to get the knowledge about the starting and speed control AC and DC machines.

CO4: Able to get the basic concepts of Drives, Electric drives, types and factors influencing the choice of electrical drives

CO5: To understand the working principle of DC &AC motors drives and their characteristics and its braking methods

CO/PO Mapping

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

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S				M		S	S		S	
CO2	S		M	S	M	W	M			M		
CO3							M	M	S			
CO4		M	S	M			W				S	M
CO5	S				S	M			M	S		S

COURSE ASSESSMENT METHODS

Direct	Indirect

1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I CIRCUITS AND TRANSFORMERS 6

D.C. Voltage, current, power-Ohms law-series, parallel circuits – Kirchoff's laws – mesh analysis – A.C. voltage – sinusoidal waves, phasor representation – power factor – complex power - basic idea of transformers – simple problems.

UNIT II ELECTRICAL MOTORS 12

Constructional details, principle of operation and performance characteristics of D.C. motors, single phase induction motor, three phase induction motor, synchronous motors, universal motors, stepper motors and reluctance motor.

UNIT III SPEED CONTROL AND STARTING 9

Speed control of D.C. motors – three phase induction motors – starting methods of D.C. motor and three phase induction motor – electrical braking – simple problems.

UNIT IV ELECTRICAL DRIVES 9

Type of Electrical Drives – Selection & factors influencing the selection – heating and cooling curves – loading condition and classes of duty – determination of power rating – simple problems.

UNIT V SOLID STATE DRIVES (QUALITATIVE TREATMENT ONLY) 9

Advantages of solid state drives – D.C. motor control using rectifiers and choppers – control of induction motor by V, V/f and slip power recovery scheme using inverters and A.C. power regulators.

TOTAL NO. OF PERIODS: 45

Text Books:

1. *S.K. Bhattacharya "Electrical Machines" Tata McGraw-Hill Pvt. Company Ltd., 3rd edition, 2008.*

References:

1. *I.J. Nagrath, T.P. Kothari., "Basic Electrical Engineering", McGraw-Hill Publishing company Ltd., Second edition, 2002.*
2. *N.K.De.,P.K.Sen "Electric Drives", Prentice Hall, First edition 1999.*
3. *G.K. Dubey "Fundamental Electrical Drives" second edition 2002, Narosa Publications, Second edition, 2002.*
4. *Pillai, S.K., "A Seish course on Electrical Drives", Wilay Eastern Ltd., New Delhi, 1982.*

BMT3L1 **ELECTRONIC DEVICES AND ELECTRONIC CIRCUITS – LAB** **0 0 4 2**

OBJECTIVE:

- To study the characteristics of various electronics components
- To design basic electronics circuits like power supply, oscillator, amplifier etc
- To know the working of basic electronics circuits like power supply, oscillator, amplifier etc

Course Outcomes

CO01 - To study the characteristics of diodes like PN diode and zener diode
CO02 - To study the I/O characteristics of transistors in various configurations
CO03 – To study the various characteristics of power transistors
CO04 – To study the various characteristics of special transistors
CO05 – To design and test rectifier circuits and series voltage regulators
CO07 – To design and test amplifier, oscillator, multivibrator and clipper and clamper circuits

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M		S		S							
CO2	M		S		S							
CO3	M		S		S							
CO4	M		S		S							
CO5	M		S		S							
CO6	M		S		S							

Course Assessment Methods:

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

LIST OF EXPERIMENTS

1. Characteristics of PN junction and Zener diode.
2. Input and Output characteristics of CB ,CE configuration.
3. Drain and Transfer characteristics of JFET.
4. Characteristics of SCR ,Triac, Diac & UJT.
5. Half wave Rectifier & Full Wave rectifier.

6. Series voltage regulator.
7. Design of RC coupled amplifier &FET Amplifier.
8. Hartley Oscillator & Colpitt's oscillator.
9. Astable, Monostable , Bistable Multivibrator.
10. Clippers & clampers.

TOTAL NO. OF PERIODS: 60

LIST OF EQUIPMENTS AND COMPONENTS

1.	Variable Power Supply (0-30V)	-	6
2.	CRO	-	4
3.	Digital Multimeter	-	6
4.	Function Generator	-	4
5.	DC Ammeter	-	4

Consumables

6. Transformers
7. Resistors ¼ Watt Assorted
8. Capacitors
9. Inductors
10. Diodes and Zener diodes
11. Bread Boards
12. ICS – 555, 741, LM 328, LM 324
13. BC107, BC147,BC 108, BC 148, BC547, BC 548, SL 100, SK100 or Equivalent transistors
14. Wires

BMT3L2 ELECTRICAL MACHINES & DRIVES LAB 0 0 4 2

OBJECTIVES:

- Information to supplement to the Electric Machines course.
- The ability to conduct testing and experimental procedures on different types of electrical machines.
- A chance to practice different types of wiring and devices connections.
- The capability to analyze the operation of electric machines under different loading conditions

COURSE OUTCOMES

CO1: Understand the concept of efficiency and the short circuit impedance of a three-phase transformer from no-load test, winding resistance, short circuit test, and load test.

CO2: Understand the effect of unbalanced loading on a three-phase transformer with different connections, and the effects and limitations of each connection..

CO3: Understand the starting and connecting procedures of synchronous generators, and to obtain the 'V' curves of synchronous motors.

CO4: Experimentally obtain the load characteristics of various dc motors and generators

CO5: Experimentally obtain the load characteristics, starting current and starting torque of a squirrel-cage induction motor and to derive circuit parameters from no-load and blocked-rotor tests

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

COURSE ASSESSMENT METHODS

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

LIST OF EXPERIMENTS

1. Load test on D.C. shunt motor.
2. Speed control of D.C. shunt motor.
3. Swinburne's test
4. Load test on three phase induction motor.
5. No load and blocked rotor tests on three-phase induction motor.
6. Load test on single phase induction motor.
7. No load and blocked rotor tests on single phase induction motor.
8. Load test on Synchronous motors
9. Performance characteristics of Stepper motors.
10. Performance characteristics of single phase transformer.

TOTAL NO. OF PERIODS: 60

LIST OF EQUIPMENT

(For a batch of 30 students)

S.No	**Equipments**	**Qty**
1.	Shunt motor 5HP	3
2.	Single phase Induction Motor 2HP	2

3.	Three phase induction Motor 5HP	2
4.	Single phase transformer 2KVA	1
5.	Three phase quto transformer	2
6.	Single phase auto transformer	2
7.	3 point starter	3
8.	DPST, TPST	Each 2
9.	DC source 300v, 100A	1
10.	Ammeter (0-5A), (0-10A) MC	Each 2
11.	Ammeter (0-5A), (0-10A) MI	Each 2
12.	Voltmeter (0-300V) MC	3
13.	Voltmeter (0-150V), (0-300V), (0-600V) MI	Each 2
14.	Wattmeter 150/300V, 5/10A UPF	2
15.	Wattmeter 300/600V, 5/10A UPF	2
16.	Wattmeter 150/300V, 5/10A LPF	2
17.	Wattmeter 300/600V, 5/10A LPF	2
18.	Stepper motor 5Kg	1
19.	Synchronous motor 5KW	1
20.	Rheostat 360 ohm/1.2A	3
21.	Rheostat 50 ohm/5A	3
22.	Tachometer	5

BMT3L3 COMPUTER AIDED MACHINE DRAWING 0 0 4 2

UNIT I **9**

Indian standard code of practice for engineering drawing – general principles of Presentation. Conventional representations of threaded parts, springs, gear and Common features. Abbreviations and symbols for use on technical drawings. Conventions for sectioning and dimensioning.

UNIT II **9**

Tolerances – types – representation of tolerances on drawing, fits – types – selection of Fits – allowance. Geometric tolerances – form – and positional tolerances – datum, datum Features. Maximum material principle – symbols and methods of indicating it on drawing Surface finish symbols – welding symbols and methods of indicating it on drawing.

UNIT III (Drafting work using mini drafter) **9**

Preparation of part and assembly drawings of Plummer block, screw jack, machine vice, lathe tailstock, tool head of the shaper, stuffing box, piston & connecting rod universal join)

UNIT IV **9**

Introduction to the use of any drafting software – creation of simple geometric bodies using primitives (line, arc, circle etc.,) and editing for the drawing, Dimensioning and text writing, concept of layer creation and setting, line types.

UNIT V **9**

Preparation of 2-D drawings using CAD software for components and assemblies of Plummer block, screw jack, machine vice, lathe tailstock, tool head of the shaper. Introduction to 3-D

modeling solid and wire frame modeling.

TOTAL NO. OF PERIODS: **60**

Text Books :

1. *Sadhu Singh & P.L. Sah, Fundamentals of Machine Dynamics, Prentice Hall of India Pct Ltd, 2003.*

2. P.N. Rao, CAD/CAM Principles and Applications, Tata McGraw-Hill 2004. 2nd Edition.

References :

1. K. Venugopal, Engineering Graphics AutoCAD, John Wiley & Sons, 2002. 4th Edition.

List Of Equipment And Software Required (for a batch of 30 students)

1.	Computer System VGA Color Monitor, Pentium IV Processor, 20 GB HDD, 256 MB RAM	30
2.	Laser Printer	01
3.	Plotter (A2 size)	01
4.	Software: AutoCAD or Mechanical Desktop or Pro / E or CATIA or IDEAS or Solidworks	30 Licenses
5.	Drawing Boards and Tables in Drawing Hall	30 Nos.

BMA402 NUMERICAL METHODS 3 1 0 4

OBJECTIVES:

This course aims at providing the necessary basic concepts of a few numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.

OUTCOMES:-

At the end of the course, the students would

CO01- Have a fundamental knowledge of the basic solutions of equations and eigen value problems.

CO02- Have a well-founded knowledge of standard numerical differentiation and integration which can describe real life phenomena.

CO03- Acquire skills in handling situations involving first and second order differential equations

CO04- Understand boundary value problems on ordinary and partial differential equations

CO05- Be able to analyze the interpolation techniques.

CO/PO Mapping

S – Strong, M – Medium, W – Weak

Cos	**Programme Outcomes (Pos)**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**

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

Course Assessment Methods:

Direct		**Indirect**	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEM 12

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

UNIT II INTERPOLATION (FINITE DIFFERENCES) 12

Newton's Divide difference formula, Lagrange's interpolation-forward and backward difference formula-Stirling's Bessel's central difference formula

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 12

Numerical differentiation with interpolation polynomials, Numerical integration by Trapezoidal Simpson's (Both 1/3" and 3/8") rule, Double integrals using Trapezoidal and Simpson's rule

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 12

Single step methods, Taylor series, Euler and modified Euler, Runge kutta method of first and second order differential equations, multiple step methods, Milne and Adam's –Bash forth predic and corrected method

UNIT V BOUNDARY VALUE PROBLEMS FOR ODE AND PDE 12

Finite difference for the second order ordinary differential equations, finite difference solutions for one dimensional heat equations (both implicit and explicit), one dimensional wave equation, Two dimensional, Laplace and Poisson equation.

TOTAL NO. OF PERIODS: 60

Textbooks:

1. M.K.Venkatraman'Numerical methods', NPC, Chennai

References:

1. Jain.M.K.Iyengar, S.R.K.Andjain, RK Numerical methods for scientific and Engineering

computation,(3rd edition, New age International pub,Co(1993))
3. *Grewal.B.S.'Higher Engineering Mathematics' (40th edition) Khanna publisher, Delhi, 2007.*

BME401 DYNAMICS OF MACHINES 3 1 0 4

OBJECTIVE:

- To introduce the concept of dynamics of machines
- To acquaint the student with various technique involved in dynamics
- To introduce the various new technology in dynamics of machines

Course Outcomes

CO01 - To learn the concept about force analysis for mechanism
CO02 – To understand the various methods of balancing in different situation
CO03 – To learn the Concept about free vibration of single degree of freedom
CO04 – To learn the Concept about forced vibration of single degree of freedom
CO05 - To learn the concept about critical speed of rotating shaft

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S			M			W				
CO2	S	S			M							
CO3	S	S			M			W				
CO4	S	S			M							
CO5	S	S			M			W				

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I FORCE ANALYSIS OF MECHANISMS 12

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

UNIT II BALANCING 12

Static and dynamic balancing-Balancing of rotating masses- Balancing of several masses in different planes. Primary and secondary unbalanced forces of reciprocating parts-Balancing of in

line engines- Firing order- Balancing of 'V' and 'W' engines.

UNIT III FREE VIBRATIONS OF SINGLE DEGREE OF FREEDOM SYSTEMS 12

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

UNIT IV FORCED VIBRATIONS OF SINGLE DEGREE OF FREEDOM SYSTEMS 12

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

UNIT V CRITICAL SPEEDS AND SHAFTS WITH ROTORS 12

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

TOTAL NO. OF PERIODS: 60

Text Books:

1. *S.S.Rattan-Theory of Machines- Tata McGraw Hill(3 rd edition), 2009.*
2. *Singh.V.P. Mechanical Vibrations-Dhanpatrai & co (p) Ltd(3 rd edition), 2006*

References:

1. *Rao.J.S. and Dukkipatti, Mechanism and Machines Theory, 2nd Edition-Wiley Eastern Ltd, 1992.*
2. *Balaguru.S. Dynamics of Machinery, Scitech Publications (india) Pvt Ltd, 2011*
3. *Grover.G.K. Mechanical Vibrations- Nemchand & Bros.(7 th edition), 2003.*

BMT401 MANUFACTURING TECHNOLOGY 3 0 0 3

OBJECTIVE:

- To introduce the manufacturing technology for to production new product
- To acquaint the student with various manufacturing technology used in production engineering.
- To introduce the current trends in the production technology

Course Outcomes

CO01 - To learn different types of foundry technology
CO02 – To understand the different types of forming– processes
CO03 – To learn the material removal processes and machine (i.e. lathe)
CO04 – To learn the material removal processes and machine **(**i.e. milling)
CO05 - To learn the principles & applications of joining processes

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M			S	S							
CO2					S							
CO3		M		S	S							
CO4				M	S							
CO5					S							

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I FOUNDRY TECHNOLOGY 9

Pattern and Core making – Moulding sand – Melting furnaces Cupola and Induction furnaces – Special casting processes – Shell, Investment, Die casting – Defects in casting.

UNIT II FORMING– PROCESSES 9

Hot and Cold Working
Rolling: Introduction – Rolling Mills – Rolling Operations – Production of Seamless Tubing and Pipe.
Forging : Introduction – Related Forging Operations – Drop forging
Extrusion and Drawing: Extrusion Practice – Hot, Cold, Impact and Hydrostatic extrusion. Drawing Process – Defects and Residual Stresses – Drawing Equipment. Sheet metal operations – Blanking, Punching and Piercing.

UNIT III MATERIAL – REMOVAL PROCESSES 9

Lathes and Lathe Operations, Drilling and Drilling Machines, Reaming and Reamers, Tapping and Taps – Tool nomenclature, cutting speed, feed, machining Time calculations.

UNIT IV MATERIAL – REMOVAL PROCESSES 9

Milling Machines and Operations, Planning and Shaping, Broaching, Gear Hobbing and Shaping.

Grinding Process – Abrasives – Finishing Operations – Lapping, Honing Powder coating.

UNIT V PRINCIPLES & APPLICATIONS OF JOINING PROCESSES 9

Gas welding, Basic Arc Welding Processes, Thermit Welding, Electron – Beam Welding, Laser – Beam Welding.
Solid State Welding: Cold Welding, Ultrasonic Welding, Friction Welding, Resistance Welding

and Explosive Welding.
Principles and applications of Brazing and Soldering.

TOTAL NO. OF PERIODS: 45

Text Books:

1. KALPAKJIAN, S., "Manufacturing Engineering and Technology", Pearson education India, 5th edition, 2006 (SBN 0-13-148965-8)

References:

1. Hajra Choudhury, S.K., and Haqjra Choudhury, A.K., "Elements of Workshop Technology", Volume I and II, Media Promoters and Publishers Private Limited, Mumbai, 1997.
2. Paul Degarma E, Black J.T. and Ronald A. Kosher, Eighth edition, Materials and Processes in Manufacturing Prentice – Hall of India, 1997.
3. Sharma P.C. A Textbook of Production Technology, S. Chand and Co., Ltd., 2007.

BEE404 POWER ELECTRONICS 3 1 0 3

OBJECTIVES:

- To get an overview of different types of power semi-conductor devices and their characteristics.
- To understand the operation, characteristics and performance parameters of controlled rectifiers.
- To study the operation, switching techniques and basic topologics of DC-DC converters.
- To learn the operation of different types of inverters like VSI, CSI, PWM Inverters, Series inverter and parallel inverter.
- To study the operation of AC voltage controller and cycloconverters.

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak									
COs	Programme Outcomes (POs)								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	**S**	**S**	**M**	**S**	**W**			**S**	**S**
CO2	**S**	**S**	**S**	**S**	**S**			**S**	**S**
CO3	**S**	**S**	**S**	**S**	**S**			**S**	**S**
CO4	**M**	**M**	**W**	**S**	**M**			**S**	**S**
CO5	**S**	**S**	**S**	**S**	**S**			**S**	**S**

Course Assessment methods:

Direct		**Indirect**	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni

5	Online test		
6	End Semester Examinations		

UNIT I POWER SEMI CONDUCTOR DEVICES 9

Principle of operation – Characteristics of power diodes, SCR, TRIAC, GTO, Power BJT, Power MOSFET and IGBT – Thyristor protection circuits.

UNIT II. PHASE CONTROLLED CONVERTERS 9

Single phase full converters, 3 phase half converter and 3 phase full converter – inverter operation – input power factor – effect of source inductance – Thyristor triggering circuits.

UNIT III. DC TO DC CHOPPERS 9

DC Chopper – Principle of operation – step up and step down chopper – Forced commutation – different techniques – voltage, current and load – commutated choppers – step up and step down chopper.

UNIT IV INVERTERS 9

Voltage source inverters – series, parallel and bridge inverters – PWM inverters – current source inverters.

UNIT V. AC VOLTAGE CONTROLLERS AND CYCLOCONVERTERS 9

Single phase AC voltage controller – multistage sequence control – step up and step down cycloconverters – three phase to single phase and three phase cycloconverters.

TOTAL NO. OF PERIODS: 45

Text Books:

1. *Reshid, M.H., "Power Electronics – Circuits Devices and Application" Prentice Hall International, New Delhi, 3rd Edition, 2011.*

References:

1. Lander, W., "Power Electronics" McGraw-Hill and Company, 3rd Edition, 2004.
2. Singh, M.D., Khanchandani, K.B., "Power Electronics", Tata McGraw-Hill, 2003.
3. Dubey, G.K., Doradia, S.R., Joshi, A. and Singh, R.M., "Thyristorised Power Controllers", Wiley Eastern Limited, 1986.
4. Joseph Vithayathil, "Power Electronics – Principle and Applications", and Robbins, "Power Electronics", McGraw-Hill Inc, New York, 1995.
5. Mohan Undeland and Robbins, "Power Electronics", John Wilry and Sons, New York, 1995.

BEI402 CONTROL SYSTEMS 3 1 0 4

OBJECTIVE:

- To introduce the concept of Control System for the industrial field

- To acquaint the student with various technique used in control systems
- To introduce the Various new technology in controlling the industrial product

Course Outcomes

CO01 - To learn the concept of System and their representation
CO02 – To understand the Concept of time response analysis
CO03 – To learn the Concept of frequency response analysis
CO04 – To learn the various methods for stability of the systems
CO05 - To learn the various types of compensation

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S			M							
CO2	S	S	W		M							
CO3	S	S		W	M							
CO4	S	S			M							
CO5	S	S			M							

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I SYSTEMS AND THEIR REPRESENTATION 9

Basic elements in control systems – open and closed loop systems Examples – Mathematical model, Translational & Rotational systems – transfer function – block diagram reduction techniques – signal flow graph.

UNIT II TIME RESPONSE 9

Time response – time domain specifications – types of test inputs – I and II order system response – error coefficients – generalized error series – steady state error – P, PI, PD, PID Controller characteristics.

UNIT III FREQUENCY RESPONSE ANALYSIS AND DESIGN 9

Performance specifications – correlation to time domain specifications – Bode plots and polar plots – gain and phase margin – constant M and N circles and Nichols chart – all pass and non-minimum phase systems.

UNIT IV STABILITY OF CONTROL SYSTEMS 9

Characteristic equation – location of roots in s-plane for stability – Routh Hurwitz criterion – root locus techniques – construction – gain margin and phase margin – Nyquist stability criterion.

UNIT V COMPENSATION DESIGN 9

Design concepts – realization of basis compensation – cascade compensation in time domain and frequency domain (simple MATLAB applications to analysis and compensators design problems.)

TUTORIALS

MATLAB applications: Partial Fraction expansion, Transformation of Mathematical models, Transient response analysis, Root locus, Bode diagrams, Nyquist plots with MATLAB. Simple MATLAB applications to analysis and compensator design problems.

TOTAL NO. OF PERIODS: 45

Text Books:

1. Gopal M, "Control System Principles and Design", Tata McGraw-Hill, 2008

References:

1. Katsuhiko Ogata, "Modern Control Engineering", 4th Edition, Pearson Education 2004
2. *ChesmondC.J."Basic Control System Technology", Viva Low Priced Student Edition, 1998.*
3.Datton K., Banaclough W. and Thompson S., "The Art of Control Engineering", Addison Wesley 2002
4. Dorf R.C. and Bishop R.H., "Modern Control systems", Addison – Wesley, 1995 (MATLAB reference)
5.Leonard N.E. and William Levine, "Using MATLAB to Analyze and Design Control Systems", Addision Wesley(2 nd edition), 1995.

Web Sites References:

1. *www.mathworks.com*
2. *www.relisoft.com*

BCE406 ENVIRONMENTAL STUDIES 3 0 0 3

OBJECTIVE:

- To introduce the multidisciplinary nature of environmental studies.
- To get the knowledge about ecosystems structure and function of an ecosystems .
- To know the knowledge about biodiversity and its conservation and environmental pollution.
- To get the knowledge about social issues and the public awareness.
- To get the knowledge about human population and the women and child welfare.

Course Outcomes

CO01 - To learn multidisciplinary nature of environmental studies.
CO02 – To understand the ecosystems structure and function of an ecosystems
CO03 – To learn biodiversity and environmental pollution
CO04 – To learn social issues and the public awareness
CO05 - To learn human population and the women and child welfare.

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			M		S	S	S		S	M		
CO2		M				S				S		
CO3			S			S						
CO4		M							S	S		
CO5			M			M	S				S	M

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Definition, Scope and importance, Need for public awareness

NATURAL RESOURCES: RENEWABLE AND NON RENEWABLE RESOURCES:

Natural resources and associated problems.

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

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

UNIT II ECOSYSTEMS

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

UNIT III BIODIVERSITY AND ITS CONSERVATION

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

ENVIRONMENTAL POLLUTION

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

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT

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

UNIT V HUMAN POPULATION AND THE ENVIRONMENT

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

FIELD WORK

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

TOTAL NO. OF PERIODS: 45

BMT4L1 MANUFACTURING TECHNOLOGY LAB 0 0 4 2

OBJECTIVE:

- Study of various types of lathe operations
- To produce various shapes using machines.
- To produce the gear shape

Course Outcomes

CO01 – To practices on lathe machines and make different shapes.
CO02 – To practices on making holes using drilling machine
CO03 – To practices on surface finish using milling machine
CO04 – To practices on making key ways and dove tail machining

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				S	M	W						
CO2				S	M	W						
CO3				S	M	W						
CO4				S	M	W						

Course Assessment Methods:

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

LIST OF EXPERIMENTS

UNIT 1 LATHE PRACTICE

a. Plain Turning b. Taper Turning c. Thread Cutting

Estimation of machining time for the above turning processes.

UNIT II DRILLING PRACTICE

a. Drilling b. Tapping c. Reaming

UNIT III MILLING

a. Surface Milling b. Gear Cutting c. Contour Milling

UNIT IV PLANNING AND SHAPING

a. Cutting Key Ways b. Dove tail machining.

TOTAL NO. OF PERIODS: 45

LIST OF EQUIPMENT (for a batch of 30 students)

1. Lathe - 15 Nos.
2. Drilling Machine - 1 Nos.
3. Milling Machine - 2 Nos.
4. Planning Machine - 1 Nos.
5. Shaping Machine - 2 Nos.

BMT4L2 MACHINE DYNAMICS LAB 0 0 4 2

OBJECTIVE:

- ❖ To learn about Governors /CAM
- ❖ To learn about Motorized Gyroscope
- ❖ To learn about Vibrating system Spring mass.

Course Outcomes

To Learn &Practice The Experiments Like Governors/Cam, Gyroscope, Vibrating System Mass.

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO			M			S			S	S		

Course Assessment Methods:

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

LIST OF EXPERIMENTS

1. Governors - Determination of sensitivity, effort, etc. for watt, porter, proell, Hartnell governors
2. Cam - Study of jump phenomenon and drawing profile of the cam.
3. Motorized Gyroscope-Verification of law's -Determination of gyroscopic couple.
4. Whirling of shaft-Determination of critical speed of shaft with concentrated loads.
5. Balancing of reciprocating masses.
6. Balancing of rotating masses.
7. Determination of Moment of inertia by oscillation method for connecting rod and flywheel.
8. Vibrating system Spring mass-system-Determination of damping co-efficient of single degree of freedom system.
9. Determination of influence co-efficient for multi degree freedom suspension system.
10. Determination of transmissibility ratio - vibrating table.
11. Determination of tensional frequencies for compound pendulum and flywheel -system with lumped Moment of inertia
12. Transverse vibration –free- Beam. Determination of natural frequency and deflection of beam.

TOTAL NO. OF PERIODS: 45

LIST OF EQUIPMENT (for a batch of 30 students)

1. Cam analyzer. - 1 No

2. Motorised gyroscope. - 1 No.
3. Governor apparatus - watt, porter, proell and hartnell governors. - 1 No.
4. Whirling of shaft apparatus. - 1 No.
5. Dynamic balancing machine. - 1 No.
6. Static and dynamic balancing machine. - 1 No.
7. Vibration test facilities apparatus - 1 No.

BEE4L2 POWER ELECTRONICS LABORATORY 0 0 4 2

OBJECTIVE:

- To practice SCR, MOSFET, UJT and TRIAC
- To practice the SCR converters

Course Outcomes

To learn & practice the experiments

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO			M			S			S	S		

Course Assessment Methods:

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

LIST OF EXPERIMENTS

1. Study of SCR, MOSFET & IGBT characteristics
2. UJT, R, RC firing circuits for SCR
3. Voltage & current commutated chopper
4. SCR phase control circuit
5. TRIAC phase control circuit
6. Study of half controlled & fully controller converters
7. Study of three phase AC regulator
8. Speed control of DC shunt motor using three phase fully controlled converter.
9. SCR single-phase cyclo converter
10. SCR series and parallel inverters

11. IGBT Chopper
12. IGBT based PWM inverter (single phase)

TOTAL NO. OF PERIODS: 45

LIST OF EQUIPMENT *(for a batch of 30 students)*

S.No	Equipments	Qty
1	Study of SCR, MOSFET & IGBT characteristics module	1
	IJT, R, RC firing circles for SCR module	
2	Voltage & current commutated chopper module	1
3	SCR phase control circuit module	1
4	TRIAC phase control circuit module	1
5	Study of half controlled & fully controller converters	1
6	module	1
7	Study of three phase AC regulator module	
8	Speed control of DC shunt motor using three phase fully	1
	controlled converter module	
9	SCR single phase cyclo converter module	1
	SCR series and parallel inverters module	
10	IGBT chopper module	1
11	IGBT based PWM inverter (single phase) module	1
12	Ammeter (0-5A) MC, (0-2A) MC, (0-2A) MI, (0-5V) MI	1
13	Voltmeter (0-300V) MC, (0-600V) MC,	Each 3
14	(0-300V) MI, (0-600V) MI	Each 3
	Multimeter	
15	CRO	4
16	Transformer 1KVA, 1:1, 230V	5
17		4

BMT4S1 TECHNICAL SEMINAR – I 0 0 3 1

During the Seminar session each student is expected to prepare and present a topic on engineering/ technology for 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.

TOTAL NO. OF PERIODS: 18

BMT501 THERMODYNAMICS PRINCIPLES 3 1 0 4

AND APPLICATIONS

Objectives: The purpose of this course is to introduce the undergraduate students with the basic concepts about laws of thermodynamics, air standard cycles, air compressors, vapor power and vapor compression cycles along with conduction heat transfer and convection and radiation heat transfer.

- ❖ To make the student acquire sound knowledge of first law and second law of thermodynamics
- ❖ To acquaint the students with Air compressors and air standard cycles.
- ❖ To make the students acquire sound knowledge of vapour power and vapor compression cycles.
- ❖ Studies about various modes of heat transfer and the applications of conduction and convection

Course Outcomes: •

The Course outcomes of Thermodynamics and Heat transfer subjects are:

CO01- To learn the basics about first law and second law of thermodynamics. Students will be able to understand the second law limitation of thermodynamic efficiencies and will be able to sort out realistic and unrealistic thermodynamic system claims.

CO02 - To learn air standard cycles and air compressor working principles

CO03 - Students will be able to analyze a vapor power cycle given a set of operational parameters and constraints, determine cycle efficiency, its power output, and required heat input. Students will be able to make modifications to improve the overall cycle efficiency for the steam power cycle. Students will be able to analyze and optimize a vapor refrigeration system given the requirements and constraints of a refrigeration system

CO04 – To learn the conduction heat transfer

CO05 – To learn the convection and radiation heat transfer

CO/PO Mapping
S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (Pos)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S			M	S		M			M		M
CO2			M									
CO3	M			S						M		
CO4					S		S					
CO5	S									S		

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey

2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I FIRST LAW OF THERMODYNAMICS 12

Thermodynamics – microscopic and macroscopic point of view – systems, properties, process, path, cycle. Units – pressure, temperature – Zeroth law. First law – application to closed and open systems, internal energy, specific heat capacities CV and CP – enthalpy

UNIT II SECOND LAW OF THERMODYNAMICS 12

SecondLaw of thermodynamics – statements – equivalents of Kelvin Plank and Clausius statements. Reversibility – Irreversibility, reversible cycle – Carnot cycle and theorem

UNIT III INTERNAL COMBUSTION ENGINES 12

Classification of IC engine - IC engine components and functions. Valve timing diagram and port timing diagram - Comparison of two stroke and four stroke engines, Comparison of petrol & diesel engine, Fuel supply systems, total fuel consumption, specific fuel consumption, mechanical efficiency, BHP, IHP, FP - Ignition Systems, Lubrication system, Cooling system, MPFI, DTSI, CRDI.

UNIT IV REFRIGERATION AND AIR-CONDITIONING 12

Principles of refrigeration, refrigerator& heat pump cycle, refrigerants, refrigerant properties, refrigerant selection, vapour compression refrigeration cycle, vapour absorption cycle, dry bulb temperature, wet bulb temperature, relative humidity, comfort air-conditioning, Psychrometric chart, humidification, de-humidification, air coolers, cooling towers.

UNIT V HEAT TRANSFER (Qualitative Treatment Only) 12

Heat transfer through conduction and convection, Fourier's law of conduction - Problems on one dimensional heat conduction through plain walls, composite walls, cylinder walls, spheres. Extended surfaces: Fins. Problems on heat transfer through rectangular fin, triangular fin, circumferential fin, pin fin, fin efficiency, fin effectiveness. Heat transfer through radiation, Stefan Boltzman Law, black body, grey body, shape factor. Types of Heat Exchangers.

TOTAL NO. OF PERIODS: 60

TEXT BOOK:

1. Nag P. K, 'Engineering Thermodynamics' Tata McGraw-Hill(5 th edition), 2013.

REFERENCES:

1. Michael A. Boles, Yunus A. Cengel, YunusCengel, "Thermodynamics", 7 th Edition, Mc Graw-Hill India, 2011.

2. Kothandaraman. C.P., Domkundwar. S. & Domkundwar. A.V., "A course in Thermal Engineering" Dhanpatrai & Co (P) Ltd, Fifth edition, 2010.

3. Kothandaraman. C.P., "Heat and Mass Transfer", New Age International (P),8th edition reprint Feb 2014.

4. Holman.J.P., "Thermodynamics", 3rd Ed. McGraw-Hill, 2002.

BMT502 MICROPROCESSORS & APPLICATIONS 3 0 0 3

OBJECTIVE:

- To introduce the architecture of 8085.
- To study about interfacing of 8085.
- To study about designing of input output devices

Course Outcomes

CO01 - To learn basics about 8085 block diagram.
CO02 – To understand the different types input output devices.
CO03 – To learn the interfacing devices.
CO04 – To learn matrix keyboard& digital transmission.
CO05 - To understand the applications of 8085.

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			M		S				M			
CO2					M					S		
CO3		S										M
CO4	S						M					
CO5									S		M	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I INTRODUCTION 10

Organization of Micro Computers – Organization of 8085: Architecture, Internal Register Organization and Pin Configuration – Instruction Set of 8085 – addressing modes - instruction and machine cycles with states and timing diagram. Methods of 8085 programs and 8085 assembly language.

UNIT II INTERFACING AND I/O DEVICES 9

Need for Interfacing – Memory Interfacing: address space partitioning – address map – Address decoding – Designing decoder circuit for the given address map – Bus connection and Z – line Control – Access Time Computations.
I/O Interfacing: Data transfer schemes – programmed Synchronous and asynchronous – Interrupt driven Transfer – Multiple devices and multiple interrupt levels – enabling disabling and masking

of interrupts.
DMA transfer: Cycle stealing – Burst mode – Multiple DMA devices – DMA transfer in 8085 system – serial data transfer.

UNIT III INTERFACING DEVICES 9

Programmable peripheral device – programmable interval timer (8253) – Programmable communication interface (USART) – Programmable interrupt controller – Programmable DMA Controller (8257) – Programmable Keyboard/ display controllers.

UNIT IV DESIGN USING PERIPHERAL DEVICES 9

Interfacing A/D and D/A converters – Matrix Keyboard design using 8255 using 8085 programs. Designing real time clock, detecting power failure, detecting presence of objects using 8253 – Design of Keyboard and display interfacing using 8279 – Design of digital transmission with modems and telephone lines using 8251 A.

UNIT V MICROPROCESSOR APPLICATIONS 8

Temperature monitoring system – Automotive applications – Closed loop process control – Stepper motor control.

TOTAL NO. OF PERIODS: 45

Text Books:

1. *Introduction to Microprocessor – Third Edition – Aditya P Mathur Tata McGraw- Hill Publishing Company Ltd., New Delhi 3rd Edition 2008.*

References:

1. *Microprocessor Architecture. Programming and Applications with the 8085 Ramesh Goankar, fifth edition- Penram International Publishing (India) Private Limited.*
2. *"Microprocessors and Interfacing, Programming and Hardware" Douglas V.Hall. Tata McGraw–Hill Publishing Company Ltd., (3rd edition) New Delhi, 2008.*

BMT503 INSTRUMENTATION & CONTROL 3 0 0 3

OBJECTIVE:

- To introduce the various instrumentation involved in the industry
- To acquaint the student with various instrumentation and control used in production engineering.
- To introduce the current trends in the various types of instrument.

Course Outcomes

CO01 - To learn general concept of measurement
CO02 – To understand the different types of Temperature Measurements
CO03 – To learn the different types of Pressure, Flow and Level Measurements
CO04 – To learn the different types of Displacement, Force and torque Measurements
CO05 - To learn the concept of pneumatic and electronic PID controller

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

CO1					S							
CO2	M	M		S	S							
CO3	M	S		S	S							
CO4	M	M		S	S							
C54	S	S		M	S							

Course Assessment Methods:

Direct		**Indirect**	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT 1 GENERAL CONCEPTS OF MEASUREMENT 12

Generalized Measurement System – Performance Characteristics – Static and Dynamic Characteristics – Errors in Measurements – Calibration and Standards – Generalized Performance of Zero Order, First Order and Second Order Systems – Classifications of Transducers.

UNIT 1I TEMPERATURE MEASUREMENT 9

Mechanical Type – Filled Thermometers – Liquid Filled – Gas Filled – Vapour Filled – Bimetallic Thermometer – Electric Type – RTD – Thermistor, Thermocouple, IC Thermometer – Non Contact Total Radiation Pyrometer – Optical Pyrometer.

UNIT 1II PRESSURE, FLOW AND LEVEL MEASUREMENTS 9

Pressure: Monometers – Elastic Transducers – Bourdon Gauge – bellows – diaphragm – Calibration of Pressure Gauge using Dead Weight Testers. Vaccum: McLeod Gauge, Thermal Conductivity Gauge – Ionization Gauge. Flow Measurement: Orifice, Venturi, Nozzle, Pitot Tube, Turbine Flow meter, Hot wire Anemometer.

Level Measurement: Float Level, surge type, Differential Pressure Type, Electrical Type- Resistance and Capacitance.

UNIT 1V DISPLACEMENT, FORCE, TORQUE & VIBRATION MEASUREMENT 9

Load Cells – Different Types – Potentiometer – Strain Gauges Resistive and Semiconductor – Different Forms – Measurement Circuits – Use in Displacement, Force and Torque Measurement. LVDT Characteristics – Measurement Circuits – Use in Displacement - RVDT for angular measurement. Piezo Electric Transducer – Different Types – Characteristics – Measurement Circuits – Application in Acceleration and Vibration Measurement. Optical Encoder for Displacement and Velocity Measurement.

UNIT V PNEUMATIC AND ELECTRONIC PID CONTROLLERS 6

Pneumatic and Electronic PID Controllers – Automatic Speed Control of Drives- Pneumatic Two Step Controller – Machine Tool Control.

TOTAL NO. OF PERIODS: 45

Text Books:

1. *Ernest O. Doebelin, "Measurement Systems Application and Design", McGraw-Hill Publishing Company, 5th Edition, 2006.*

References:

1. *Beckwith, T.G. and Buck, N.L. "Mechanical Measurements" Addition Wesley Publishing Company Limited, 1995.*
2. *Jain R.K. "Mechanical and Industrial Measurements" Khanna Publishers, Delhi, 1999.*
3. *Rangan, Mani and Sharma, "Instrumentation", Tata McGraw-Hill Publications, New Delhi,(2nd edition) 1989.*
4. *Nagrath I. G. and Gopal, M. "Control Systems Engineering", Wiley Eastern Limited, (5th edition) 2000.*
5. *Murthy "Transducers and Instrumentation Printing Hall of India", New Delhi, 2003.*

BMT502 CNC TECHNOLOGY 3 0 0 3

OBJECTIVE:

- To introduce the CNC technology for to production of products.
- To learn the student with various CNC technology used in production engineering.
- To introduce the industrial current trends in the production technology

Course Outcomes

CO01 - To introduce the fundamentals of CNC Technology.
CO02 – To understand the constructional features and retrofitting of CNC machines.
CO03 – To learn the types of controls system, various feedback devices and tooling
CO04 – To practice writing programs using G codes and M Codes
CO05 - To learn the economics and maintenance of CNC installation

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					S							
CO2					S							
CO3				S	S							
CO4	M	M			S							
CO5					S	M						

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I FUNDAMENTALS OF CNC MACHINES 9

Introduction to Computer Numerical Control: CNC Systems – An Overview of Fundamental aspects of machine control, Different types of CNC machines – Advantages and disadvantages of CNC machines.

UNIT II CONSTRUCTIONAL FEATURES OF CNC MACHINES AND RETROFITTING 10

Features of CNC Machines: Structure, Drive Mechanism, gearbox, Main drive, feed drive, Spindle Motors, Axes motors. Timing belts and pulleys, Spindle bearing – Arrangement and installation. Slide ways. Re - circulating ball screws – Backlash measurement and compensation, linear motion guide ways. Tool magazines, ATC, APC, Chip conveyors. Retrofitting of Conventional Machine Tools: Modification to be carried out on conventional machines for retrofitting.

UNIT III CONTROL SYSTEMS, FEED BACK DEVICES AND TOOLING 10

Description of a simple CNC control system. Interpolation systems. Features available in a CNC system – introduction to some widely used CNC control systems. Types of measuring systems in CNC machines – Incremental and absolute rotary encoders, linear scale – resolver – Linear inductosyn – Magnetic Sensors for Spindle Orientation. Qualified and pre-set tooling – Principles of location – Principles of clamping – Work holding devices.

UNIT IV CNC PART PROGRAMMING 9

Part Program Terminology-G and M Codes – Types of interpolation Methods of CNC part programming – Manual part programming – Computer Assisted part programming – APT language – CNC part programming using CAD/CAM-Introduction to Computer Automated Part Programming.

UNIT V. ECONOMICS AND MAINTENANCE 7

Factors influencing selection of CNC Machines – Cost of operation of CNC Machines – Practical aspects of introducing CNC machines in industries – Maintenance features of CNC Machines – Preventive Maintenance, Other maintenance requirements.

TOTAL NO. OF PERIODS: 45

Text Books :

1. Yorem Koren, "Computer Control of Manufacturing Systems", McGraw Hill, 2000.

References :

1. Radhakrishnan P.,Computer Numerical Control Machines,New Central Book Agency, 2000.
2. BERRY LEATHAM – JONES, Computer Numerical Control, Pitman, London, 1987.
3. STEAVE KRAR and ARTHUR GILL, CNC Technology and Programming, McGraw–Hill Publishing Company, 1990.
4. HANS B.KIEF and T.FREDERICK WATERS, Computer Numerical Control Macmillan/McGraw-Hill, 1992.
5. G.E.THYER, Computer Numerical Control of Machine Tools. Second Edition, B/H NEWNES, 1993.
6. GROOVER, M.P., Automation, Production Systems and Computer Integrated Manufacturing, Prentice Hall(3rd Edition), 2008.
7. MIKE MATTSON, "CNC Programming Cengage Learning, 2009.

BMT505 DIMENSIONAL METROLOGY 3 0 0 3

OBJECTIVE:

- To introduce concept of metrology and measurement
- To explain the various measurement systems
- To introduce the different types metrological equipments
- To introduce the using of metrological equipments

Course Outcomes

CO01 – To explain the concept of metrology and measurement and various terms used in the metrology.

CO02 – To understand the vernier caliper, micrometer and gauge block

CO03 – To explain the measurement by comparison

CO04 – To explain the optical metrology

CO05 - To explain the surface measurement

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M		S	S							
CO2					S							
CO3		M		S	S							
CO4				M	S							
CO5					S							

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I 9

Measurement & Metrology – Introduction, uses, acts and applications of measurement, codification of measurement – Accuracy, precision and reliability – Evolution of standards – metric systems – fundamental & Practical Criteria – metrological, communication and computational considerations – Rounding of numerical values. Measurements and Tolerances – Geometric Dimensioning and Tolerance – Statistics and metrology – probability and acceptance sampling.

UNIT II 9

Measurement with scales and scaled Instruments – steel rule – role of error – calipers – types and applications.

Vernier Instruments – Vernier Caliper, Depth gauge, Height gauge – height master – Three

elements of measurements. Micrometer Instruments – Principle, Types, applications. Development and use of gauge blocks – Calibration, applications, combining gauge blocks.

UNIT III **9**

Measurement by comparison – Dial Indicator – Principle, selection, use and Calibration – Accessories and attachments – constructive use of Error. High – Amplification comparators – Electronic measurement – applications – advantages of multiple scales.
Pneumatic measurement – Principles, applications and advantages of pneumatic comparators – Calibration – Role of error, Calibration Procedure.

UNIT IV **9**

Optical Flats and Optical alignment – light waves as standards – measurement with optical flats, applications of optical flat measurement – principles of optical metrology – Alignment Telescope – Straightness measurement – Optical squares and squareness measurement – Sight level – Plumbness, optical polygons – Angles, Jig Transit – Planes, Theodolite Angles and planes. Reference planes-Flatness, Perpendicularity and modern reference planes. Angle measurement-Basic geometry function, sign bars and plates and mechanical angle measurements.

UNIT V **9**

Surface Measurement – surface Evaluation, stylus method, Numerical values for surface Assessment, surface Texture specimens, surface Evaluation, other methods, Roundness measurement. Coordinate measuring machines – types, operational details and metrological features – coordinate systems. Non-contact type measurement – Principles of microscope, applications, optical comparator, profile projector, machine vision systems, Laser measurement.

TOTAL NO. OF PERIODS: 45

Text Books:

1. Connie Dotson, Ronger Harlow and Richard L. Thomson, "Fundamentals of Dimensional metrology", 5th Edition, 2009. Thomson Asia Pvt. Ltd. Singapore. ISBN 981-243-685-5.

References:

1. *R.K. Jain, "Engineering Metrology", Khanna Publishing, 2002.*
2. Gaylor, Shotbolt and Sharp, "Metrology for Engineers, O.R. Cassel, London, 1993.
3. Thomas, "Engineering Metrology", Butthinson & Co., 1984.

BEC5L2 MICROPROCESSOR LAB 0 0 4 2

OBJECTIVE:

- To learn about basic programming using 8085.
- To learn about ascending/descending order.
- To study about interfacing devices.

Course Outcomes

To understand 8085 basics and practice various programs in the laboratory.

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO			S			S			S	S		

Course Assessment Methods:

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

LIST OF EXPERIMENTS

I. PROGRAMMING 30

1. Addition of two 8-bit numbers, sum of 8-bits and 16 bits.
2. Decimal addition of two 8-bit numbers Sum: 16 bits.
3. 8-bit subtraction.
4. 8-bit decimal subtraction.
5. Additional of two 16-bit numbers, Sum: 16 bits or more.
6. Multibyte subtraction.
7. To arrange a series of numbers in Ascending order
8. To arrange a series of numbers in Descending order
9. 8-bit Multiplication.
10. 8-bit Division.
11. Decimal to hexadecimal conversion and hexadecimal number to decimal number conversion.

II. INTERFACING 30

1. Analog to digital conversion
2. Digital to analog conversion
3. Stepper motor controller.
4. Temperature controller

TOTAL NO. OF PERIODS: 60

LIST OF EQUIPMENT

(for a batch of 30 students)

S.No	Equipments	Qty
1	8085 Microprocessor trainer kits	15
2	ADC interface card	3
3	DAC interface card	3
4	Stepper motor interfacing card with stepper motor	3

5	Temperature controller with sensors like thermocouple	3

BMT5L1 INSTRUMENTATION & CONTROL LAB 0 0 4 2

OBJECTIVE:

- To introduce the concept of various instrument involved in industry.
- To acquaint the student with various practical concepts in instrumentation and control.
- To introduce the various advanced technology in controlling technique.

Course Outcomes

CO01 - To learn the practical experiments about pressure measurement and control
CO02 – To understand the practical experiments about force and torque measurement
CO03 – To learn the practical experiments about temperature measurement and control
CO04 – To learn the practical experiments about speed measurement and control
CO05 - To learn the practical experiments about application of data acquisition system for industrial purposes.

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	W			M	S							
CO2	W			M	S							
CO3	W			M	S							
CO4	W			M	S							
CO5	W			M	S							

Course Assessment Methods:

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

LIST OF EXPERIMENTS

1. PRESSURE MEASUREMENT AND CONTROL
   Pressure measuring devices – Pressure and vacuum gauge calibration.
2. TEMPERATURE MEASUREMENT AND CONTROL
   Temperature measuring devices like platinum resistance thermometer, thermocouple, radiation pyrometer, etc.
3. SPEED MEASUREMENT AND CONTROL
   Studying the devices and characters and measuring the speed using tachometer,

stroboscope, etc.

4. FORCE MEASUREMENT
   Force measuring devices, load cells and proving rings.
5. TORQUE MEASUREMENT
   Torque measurement –using torque measuring devices.
6. POWER MEASUREMENT
   Power measurement using prony brake.
7. STRAIN MEASUREMENT
   Study and use of strain – strain gauge indicator.
8. DISPLACEMENT MEASUREMENT
   LVDT-Displacement and velocity measurement using encoders.
9. SOUND MEASUREMENT
   Measurement of sound level using sound level meters.
10. Study on the application of data acquisition system for industrial purposes.

TOTAL NO. OF PERIODS: 45

BMT5L2 CNC LAB 0 0 4 2

OBJECTIVE:

- Study of CNC machines
- To teach part programming in the CNC machines
- To produce various shapes CNC machine.
- To produce the different shapes

Course Outcomes

CO01 – To practices the Manual part programming
CO02 – To practices on programming and simulation of machining
CO03 – To practices on Linear and Circular interpolation
CO04 – To practices on Pocket milling, slotting, peck drilling and other fixed canned cycles

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				S	M	W						
CO2				S	M	W						
CO3				S	M	W						
CO4				S	M	W						

Course Assessment Methods:

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

LIST OF EXPERIMENTS

1. Manual part programming using G and M codes for Turning, step turning, Taper turning, thread cutting and radius turning on cylindrical components.
2. Programming and Simulation of machining using the following features.
   (i) Linear and Circular interpolation
   (ii) Pocket milling, slotting, peck drilling and other fixed canned cycles.
   3. Given a component drawing to write the manual part programming and execute on CNC Lathe and Milling Machine.

TOTAL NO. OF PERIODS: 45

LIST OF EQUIPMENT (for a batch of 30 students)

1.	CNC Lathe with Fanuc controller	-	1 No.
2.	CNC Milling Machine with Fanuc controller	-	1 No.
3.	Master CAM software	-	10 Licenses
4.	Computer nodes	-	10 Nos.

BMT5S1 TECHNICAL SEMINAR – II 0 0 3 1

During the Seminar session each student is expected to prepare and present a topic on engineering/ technology, for 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.

TOTAL NO. OF PERIODS: 30

BMT601 SENSORS & SIGNAL PROCESSING 3 0 0 3

OBJECTIVE:

- To introduce the various Sensors involved in the industry
- To introduce sensors input and output signals processing
- To introduce the current trends in the various types of sensors and its processing

Course Outcomes

CO01 - To learn general concept of sensors and its type
CO02 – To understand the different types of Electrical sensors
CO03 – To learn the different types of smart sensors
CO04 – To learn the various types of signal conditioning
CO05 - To understand the concept of data Acquisition

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				S	S							
CO2				S	S							
CO3				S	S							
CO4				M	S							
CO5				M	S							

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I INTRODUCTION AND MECHANICAL SENSORS 10

Sensors and transducers - Classification of sensors- Static and Dynamic characteristics of sensors
Temperature: Filled thermometer – Bimetallic thermometer – monometers.
Elastic transducers– bourdon gauge – bellows – diaphragm.
Vacuum: McLeod gauge, thermal conductivity gauge –Ionization gauge
Flow measurement: orifice, venture, nozzle, pilot tube, turbine flow meter, hot wire anemometer.

UNIT II ELECTRICAL SENSORS 9

Resistive transducers – Potentiometer– RTD – Thermistor – Thermocouple – Strain gauges – use in displacement, temperature, force measurement – Inductive transducer – LVDT – RVDT – use in displacement – Capacitive transducer – Piezo electric transducer – Digital displacement transducers.

UNIT III SMART SENSORS 9

Radiation Sensors - Smart Sensors - Film sensor, MEMS & Nano Sensors – applications - Automobile, Aerospace, Home appliances, Manufacturing, Medical diagnostics, Environmental monitoring.

UNIT I V **SIGNAL CONDITIONING** **9**

Amplification, Filtering – Level conversion – Linearisation - Buffering – Sample and Hold circuit – Quantization – Multiplexer / Demultiplexer – Analog to Digital converter – Digital to Analog converter.

UNIT V ***DATA ACQUISITION*** ***8***

Data Acquisition conversion-General configuration-single channel & multichannel data acquisition – Digital filtering – Data Logging – Data conversion – Introduction To Digital Transmission system.

TOTAL NO. OF PERIODS: 45

Text Books :

1. *Patranabis. D, "Sensors and Transducers", 2nd edition PHI, New Delhi, 2003.*
2. *David G. Alciatore and Michael B.Histand, "Introduction to Mechatronics and Measurement systems", 3rd edition Tata McGraw-Hill, 2007.*

References :

1. *Bolton, -Mechatronics - Electronic Control systems in Mechanical and Electrical Engineering- , 2nd Edition, Addison Wesley Longman Ltd., 1999.*
2. *Ernest O.Doebelin, "Measurement Systems – Applications and Design", Tata McGraw-Hill, 2004.*
3. *Murthy DVS, "Transducers and Instrumentation", PHI, New Delhi – 2003.*
4. *C.S. Rangan, G.R. Sarma, VSV.Mani, "Instrumentation Devices and Systems", 2nd edition, Tata McGraw-Hill Publishing company Ltd, 2002.*

BMT602 APPLIED HYDRAULICS AND PNEUMATICS 3 0 0 3

OBJECTIVE:

- To introduce the fluid power system and its fundamentals
- To learn the student for various hydraulic and pneumatic components
- To design the various circuits using hydraulic, pneumatic and electro hydraulic components

Course Outcomes

CO01 - To introduce fundamentals of fluid power systems
CO02 - To learn various types and function of hydraulic components.
CO03 – To design hydraulic circuits for simple practical applications
CO04 – To learn various types and function of pneumatic components
CO05 - To design pneumatic circuits for simple practical applications

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					S							

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

Course Assessment Methods:

Direct		**Indirect**	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I FLUID POWER SYSTEMS AND FUNDAMENTALS 9

Introduction: Introduction to fluid power, Advantages of fluid power, Application of fluid power system. Types of fluid power systems, Properties of hydraulic fluids – General types of fluids – Fluid power symbols.

Basics of hydraulics – Applications of Pascal's Law-Laminar and turbulent flow – Reynolds's number-Darcy's equation – Losses in pipe, valves and fittings.

UNIT II HYDRAULIC SYSTEM AND COMPONENTS 9

Sources of Hydraulic Power: Pumping theory – Pump classification – Gear pump, Vane Pump, piston pump, construction and working of pumps – pump performance – Variable displacement pumps.

Fluid Power Actuators: Linear hydraulic actuators – Types of hydraulic cylinders – Single acting, Double acting special cylinders like tandem, Rodless, Telescopic. Cushioning mechanism, Construction of double acting cylinder, Rotary actuators. Fluid motors, Gear, Vane and Piston motors.

UNIT III DESIGN OF HYDRAULIC CIRCUITS 9

Construction of Control Components: Directional control valve – 3/2 way valve – 4/2, 4/3 way valve – Shuttle valve – check valve – pressure control valve – pressure reducing valve sequence valve, Flow control valve – Fixed and adjustable, electrical control solenoid valves, Relays, ladder diagram.

Accumulators and Intensifiers: Types of accumulators – Accumulators circuits, sizing of accumulators, intensifier – Applications of Intensifier – Intensifier circuit.

UNIT IV PNEUMATIC SYSTEMS & COMPONENTS 9

Pneumatic Components: Properties of air – Compressors – Filter, Regulator, and Lubricator Unit – Air control valves, Quick exhaust valves, pneumatic actuators.

Fluid Power Circuit Design, Speed control circuits, synchronizing circuit, Pneumo hydraulic circuit, Sequential circuit design for simple applications using cascade method.

UNIT V DESIGN OF PNEUMATIC CIRCUITS 9

Servo systems – Hydro Mechanical servo systems, Electro hydraulic servo systems and proportional valves.

Fluidics – Introduction to fluidic devices, simple circuits, Introduction to Electro Hydraulic

Pneumatic logic circuits, ladder diagrams, PLC applications in fluid power control. Fluid power circuits; failure and trouble shooting.

TOTAL NO. OF PERIODS:45

Text Books :

1. Anthony Esposito, "Fluid Power with Applications", Prentice Hall, 2006.

References :

1. *Anthony Lal, "Oil hydraulics in the service of industry", Allied publishers, 1982.*
2. *Harry L. Stevart D.B, "Practical guide to fluid power, "Taraoeala sons and Port Ltd. Broadey, 1976.*
3. *Majumdar S.R., "Pneumatic systems – Principles and maintenance", Tata McGraw-Hill, 1995*

BEC611 MICROCONTROLLER AND PLC 3 1 0 4

OBJECTIVE:

- To introduce the Architecture of 8051 and addressing modes.
- To get the knowledge about 8051 micro controller design and testing design.
- To know the knowledge about micro controller applications.
- To get the knowledge about programmable logic controllers and instruction set of PLC.
- To learn the knowledge about the applications of the PLC.

Course Outcomes

CO01 - To learn the Architecture of 8051 microcontroller.
CO02 – To understand the 8051 micro controller design and testing design.
CO03 – To learn the 8051 micro controller applications.
CO04 – To learn the programmable logic controllers
CO05 - To learn the applications of the PLC.

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S										
CO2	S	M	S									
CO3	M	M		S								
CO4	M		M	S								
CO5	S		S		M							

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni

5	Online test		
6	End Semester Examinations		

UNIT I INTRODUCTION TO MICROCONTROLLER 12

8051 Architecture: Microcontroller Hardware – I/O Pins, Ports – External memory – Counters and Timers – Serial data I/O – Interrupts –Instruction set of 8051-Addressing modes- Data transfer instructions, Arithmetic and Logical Instructions, Jump and Call Instructions, interrupts.

UNIT II 8051 MICROCONTROLLER DESIGN 12

8051 Microcontroller Design: 8051 Microcontroller Specification 8051 – Microcontroller System Design – Testing the Design, Timing Subroutines, Look up Tables – Serial Data Transmission.

UNIT III INTERFACING AND APPLICATIONS 12

Stepper motor control-Keyboard interfacing-Alpha-Numeric display interfacing Devices –Analog to digital converter interfacing-Digital to analog converter interfacing- Interfacing of Electronic weighing bridge.

UNIT IV INTRODUCTION TO PLC 12

Programmable Logic Controllers: Introduction – Parts of PLC – Principles of operation – PLC sizes – PLC hardware components — PLC programming Simple instructions – Connecting PLC to computer interlocks and alarms -Latching relays PLC ladder diagram, Converting simple relay ladder diagram in to PLC relay ladder diagram.

UNIT V APPLICATIONS OF PLC 12

Timer instructions ON DELAY, OFF DELAY and RETENTIVE Timers, UP COUNTER, DOWN COUNTER and UP DOWN COUNTERS, control instructions – Data manipulating instructions, match instructions; Applications of PLC –case study of Tank level control system - Automatic lubrication of supplier Conveyor belt - Automatic control of warehouse door.

TOTAL NO. OF PERIODS: 60

Text Books:

1. Kennath J. Ayala.The 8051 Microcontroller Architecture, Programming and Applications, Penram International Publishing (India), 3rd Edition, Mumbai.

2. FrankD.Petruzella."Programmable Logic Controllers",McGraw–HillBook, 1989.3rd Ed

References:

1. B.P. Singh, Microprocessors and Microcontrollers, Galcotia Publications (P) Ltd, 2nd edition, New Delhi, 1997.

2. Embedded Controller Hand book, Intel Corporation, USA.

3. Microcontroller Hand Book, INTEL, 1984.

BMT603 DESIGN OF MECHATRONICS SYSTEMS 3 0 0 3

OBJECTIVE:

- To introduce the various Mechatronics system and its design
- To acquaint the student with various design approach in Mechatronics system design.
- To introduce the current trends in the Mechatronics system design

Course Outcomes

CO01 - To learn various types of Design processes
CO02 – To understand the concept of Real time interfacing
CO03 – To learn the various case studies on Data Acquisition and control
CO04 – To learn the various case studies on Mechatronics Products
CO05 - To learn the concept of advance application in Mechatronics

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				S	S							
CO2					S		M					
CO3				S	S							
CO4				M	S							
5O4				S	S							

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I INTRODUCTION 9

Introduction to Mechatronics system – Key elements – Mechatronics Design process – Types of Design – Traditional and Mechatronics designs – Advanced approaches in Mechatronics - Man machine interface, industrial design and ergonomics, safety.

UNIT II REAL TIME INTERFACING 9

Introduction - Elements of data acquisition and control - Overview of I/O process – Overframing. selection of interface cards--DAQ card-single channel-multichannal-RS232/422/485communication- IEEE 488 standard interface-GUI card-GPIB-Ethernet switch - Man machine interface.

UNIT III CASE STUDIES ON DATA ACQUISITION AND CONTROL 10

Case studies on Data Acquisition: Introduction – Cantilever Beam Force Measurement system– Transducer calibration system for Automotive applications – Strain gauge weighing system – Solenoid Force-Displacement calibration system.

Case studies on Data Acquisition and control: Introduction – pH control system – Dc-Icing Temperature Control system – Skip control of a CD Player – Auto focus Camera, exposure control.

UNIT IV CASE STUDIES ON DESIGN OF MECHATRONIC PRODUCTS 9

Introduction–Fuzzy based Washing machine – Autofocus Camera, exposure control– Motion control using D.C.Motor & Solenoids – Engine management systems. – Controlling temperature of a hot/cold reservoir using PID- Control of pick and place robot – Part identification and tracking using RFID – Online surface measurement using image processing

UNIT V ADVANCED APPLICATIONS IN MECHATRONICS DESIGN 8

Introduction–Sensors for condition Monitoring – Mechatronic Control in Automated Manufacturing – Artificial intelligence in Mechatronics – Fuzzy Logic Applications in Mechatronics – Microsensors in Mechatronics

TOTAL NO. OF PERIODS: 45

Text Book :

1. *Devdas shetty, Richard A. Kolk, "Mechatronics System Design", Thomson Learning Publishing Company, Vikas publishing house, 2001.*

References :

1. Bolton, -Mechatronics - Electronic Control systems in Mechanical and Electrical Engineering-, 2nd Edition, Addison Wesley Longman Ltd., 1999.
2. Brian Morriss, Automated Manufacturing Systems - Actuators, Controls, Sensors and Robotics, Mc Graw Hill International Edition, 1995.
3. Bradley, D.Dawson, N.C. Burd and A.J. Loader, Mechatronics: Electronics in Products and Processes, Chapman and Hall, London, 1991.

BME605 COMPUTER INTEGRATED MANUFACTURING 3 0 0 3

OBJECTIVE:

- To introduce the CAD and CAM
- To explain the computer integrated manufacturing
- To explain the various component design using computer
- To explain the various production management system

Course Outcomes

CO01 – To introduce the CAD and its element
CO02 – To explain the elements of cad systems and design using computers
CO03 – To explain the various component design using computer
CO04 – To explain the computer aided manufacturing
CO05 - To explain the computer integrated manufacturing

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

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

Course Assessment Methods:

Direct		**Indirect**	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I INTRODUCTION TO CAD AND ITS ELEMENTS 9

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

UNIT II ELEMENTS OF CAD SYSTEMS AND DESIGN USING COMPUTERS 9

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

UNIT III DESIGN USING COMPUTERS 9

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

UNIT 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.

TOTAL NO. OF PERIODS: 45

Text Book:

1. *Radhakrishnan P. CAD/CAM/CIM, 3rd Edition, New central Book Agency, 2006.*

References:

1. *Rao P.N. CAD/CAM, Principles and Application, Tata McGraw Hill, 2005.2nd Edition.*
2. *Mikell P.Groover, Automation, Production Systems and CIM, 4th Edition, Prentice Hall of India,2001.*
3. *Chris McMahon and Jimmy Browne, CAD/CAM, Pearson Education,* 2001.2nd Edition.

BMT6L1 SENSORS AND SIGNAL PROCESSING LAB 0 0 4 2

OBJECTIVE:

- To introduce the concept of signal processing and various types of sensor
- To acquaint the student with various practical concepts in sensors and signal processing
- To introduce the various advanced technology in smart sensor

Course Outcomes

CO01 - To learn the concept wave shaping circuit and A/D converter
CO02 – To understand the practical experiments about speed sensor and proximity sensor
CO03 – To learn the practical experiments about V/F and F/V converter
CO04 – To learn the practical experiments about temperature sensors
CO05 - To learn the practical experiments about displacement sensors

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	W			M	S							
CO2	W			M	S							
CO3	W			M	S							
CO4	W			M	S							
CO5	W			M	S							

Course Assessment Methods:

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

LIST OF EXPERIMENTS

1. Wave Shaping circuit
2. Analog to Digital Converters
3. Digital Comparator
4. Speed measurement using Inductive pickup / Proximity sensor
5. Voltage to frequency converter
6. Frequency to Voltage Converter
7. Measurement of temperature using thermocouple, thermistor and RTD
8. Measurement of displacement using LVDT & Capacitive transducer
9. Position and velocity measurement using encoders
10. Position measurement using linear scales
11. Absolute encoders

TOTAL NO. OF PERIODS: 45

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.No	Equipment	Qty
1	Cathode Ray Oscilloscope	5
2	Function Generator	5
3	Regulated power supply	7
4	Displacement Measurement Trainer using LVDT	1
5	Capacitive pickup trainer module (dielectric)	1
6	Position and Velocity measurement using encoder kit	1
7	Position measurement using linear scales kit	1
8	Speed Measurement uses inductive pickup /Proximity sensor kit	1
9	Speed measurement and closed loop control of DC Motor using photo electric pickup kit	1
10	RTD module	1
11	Thermistor module	1
12	Thermocouple module	1
13	Absolute encoder	1
14	PC based data acquisition unit (optional)	1

BEC6L6 MICROCONTROLLER & PLC LAB 0 0 4 2

OBJECTIVE:

- To introduce the Architecture of 8051.
- To get the knowledge about 8051 micro controller Programming Exercises.
- To know the knowledge about stepper motor and DC motor interfaces.
- To get the knowledge about programmable logic controllers and interrupt structure of 8051.
- To learn the knowledge about the Sequential operation pneumatic cylinders.

Course Outcomes

CO01 - To learn the Architecture of 8051 microcontroller.
CO02 – To understand the 8051 micro controller Programming Exercises.
CO03 – To learn the 8051 micro controller applications.
CO04 – To learn the Architecture of the programmable logic controllers.
CO05 - To learn the Sequential operation pneumatic cylinders..

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S										
CO2	S	M	S									
CO3	M	M		S								
CO4	M		M	S								
CO5	S		S		M							

Course Assessment Methods:

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

LIST OF EXPERIMENTS

1. Study of Microcontroller Kits.
2. 8051 / 8031 Programming Exercises.
3. Stepper Motor interface.
4. D.C. motor controller interface.
5. Study of interrupt structure of 8051.
6. Interfacing high power devices to microcomputer port lines, LED relays and LCD displays.
7. Linear actuation of hydraulic cylinder with counter and speed control.
8. Hydraulic rotation with timer and speed control.
9. Sequential operation of pneumatic cylinders.
10. Traffic light controller.
11. Speed control of DC motor using PLC.
12. Testing of Relays using PLC.

TOTAL NO. OF PERIODS: 45

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.No	Equipments	Qty
1	Regulated power supply	7
2	Pulse generator	1
3	Function generator	5
4	Cathode ray osalloscope	5
5	8051 MicroController Kit	5
6	stepper Motor	2
7	stepper motor interfacing board	2
8	PLC trainer kit and related software	2
9	Hudraulic cylinder	1
10	Pneumatic cylinder	1
11	LED/LCD interface units	1
12	SCR/Triac/Power MOSFET interface unit	1

BMT6L2 HYDRAULICS & PNEUMATICS LAB 0 0 4 2

OBJECTIVE:

- 1.To introduce design and testing hydraulic and pneumatic circuits
- 2.To learn the various control valves like flow, pressure, direction
- 3.To practice the simulation using given software

COURSE OUTCOMES

CO01 - To design and test the hydraulic circuits using various valves
CO02 - To design and test the pneumatics circuits using various valves
CO03 – To model and analysis of fluid power system using MATLAB/LABVIEW
CO04 – To simulate basic electric, hydraulic and pneumatic circuits

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			S		S							
CO2			S		S							
CO3			S		S							
CO4			S		S							

Course Assessment Methods:

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

Viva Voce	Alumni
End semester exam	

LIST OF EXPERIMENTS

1. **Design and testing of hydraulic circuits such as**
   - **i)** Pressure control
   - **ii)** Flow control
   - **iii)** Direction control
   - **iv)** Design of circuit with programmed logic sequence, using an optional PLC in hydraulic Electro hydraulic Trainer.
2. **Design and testing of pneumatic circuits such as**
   - **i)** Pressure control
   - **ii)** Flow control
   - **iii)** Direction control
   - **iv)** Circuits with logic controls
   - **v)** Circuits with timers
   - **vi)** Circuits with multiple cylinder sequences in Pneumatic Electro pneumatic Trainer.
3. Modeling and analysis of basic electrical, hydraulic, and pneumatic systems using **MATLAB/LABVIEW** software.
4. Simulation of basic hydraulic, pneumatic and electrical circuits using Automation studio software.

TOTAL NO. OF PERIODS: 45

LIST OF EQUIPMENT(for a Batch of 30 students)

S.No	Equipments	Qty
	Hydraulic Equipments	4
1	Pressure relief valve	2
2	Pressure reducing valves	2
3	Flow control valves	1
4	Pressure switch	2
5	Limit switches	1
6	Linear actuator	1
7	Rotary actuator	2
8	Double solenoid actuated DCV	1
9	Single solenoid actuated DCV	1
10	Hydraulic power pack with 2 pumps & 2 pressure relief valve	1
11	PLC	
	Pneumatics Equipment	
1	Pneumatic trainer kit with FRL Unit, Single acting cylinder, push buttons	1
2	Pneumatic trainer kit with FRL unit, Double acting cylinder, manually actuated DCV	1
3	Pneumatic training kit with FRL unit, Double acting cylinder, pilot actuated DCV	1
4	Pneumatic trainer kit with FRL unit, Double acting	

	cylinder, Double solenoid actuated DCV, DCV with	1
5	sensors/ magnetic reed switches	1
6	PLC with Interface card	1
7	LABVIEW Software& Automation studio software	1

BMT6S1 TECHNICAL SEMINAR – III 0 0 3 1

During the Seminar session each student is expected to prepare and present a topic on engineering/ technology, for 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.

TOTAL NO. OF PERIODS: 15

BMT702 SIMULATION & MODELING FOR MT 3 0 0 3

OBJECTIVE:

- To introduce the concept of Simulation and Modeling
- To acquaint the student with various technique used in simulation of Mechatronics system
- To introduce the current trends in Simulation and Modeling

Course Outcomes

CO01 - To learn the concept of system and simulation
CO02 – To understand the various methods of generating and testing of random number
CO03 – To learn the various methods of random Variate generation
CO04 – To learn the concept about analysis of simulation data
CO05 - To learn the various software for simulation and modeling

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M			M	S							
CO2	M			W	S							
CO3	M			M	S							
CO4					S							
CO5				S	S							

Course Assessment Methods:

Direct	Indirect

1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I **9**

System and System Environment: Component of a System – Continuous and discrete systems – Types of model; Steps in Simulation study; Simulation of an event occurrence using random number table – Single server queue –two server queue – inventory system.

UNIT II **9**

Random number generation: Properties of random numbers – Generation of Pseudo – random numbers – techniques of generating pseudo random numbers; Test for random numbers: the Chisquare test-the kolmogrov Smirnov test – Runs test – Gap test – poker test.

UNIT III ***9***

Random – Variate Generation: Inverse transform technique for Exponential, Uniform, triangular, weibull, empirical, uniform and discrete distribution, Acceptance rejection method for Poisson and gamma distribution; Direct Transformation for normal distribution.

UNIT IV **9**

Analysis of simulated Data – Data collection, identifying the distribution, Parameter estimation, goodness of fit tests, verification and validation of simulation models.

UNIT V **9**

Comparison and selection of GPSS, SIMSCRIPT, SLAM; Arena simulation languages: Development of simulation models using Arena simulation package for queuing system, Production system, inventory system, maintenance system.

TOTAL NO .OF PERIODS: 45

Text Book:

1. *Banks J., Carson J.S. and Nelson B.L., "Discrete – Event System Simulation", 5th Edition, Pearson Education, Inc 2006 (ISBN 81-7808-505-4).*

References:

1. *Geoffrey Gorden, "System Simulation", Prentice Hall of India, 2003.*
2. Narsingh Deo., "System Simulation with Digital Computer", Prentice Hall of India, 2003.

Web References :

1. www.arenasimulation.com
2. www.gpss.co.uk
3. www.caciasl.com
4. Other useful sites can be found in the text book recommended for this course.

BMT701 ROBOTICS & MACHINE VISION SYSTEMS 3 0 0 3

OBJECTIVE:

- To introduce the automation and robotics
- To explain the different types of robots and its components
- To introduce the machine vision
- To explain the various image processing technique

Course Outcomes

CO01 – To introduce the automation, robotics and its components
CO02 – To explain the inverse kinematics and reverse kinematics
CO03 – To explain the various end effectors and sensors used in robot
CO04 – To explain the machine vision technique
CO05 - To explain the image processing technique and application of MV

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					S							
CO2	M			M	S							
CO3				M	S							
CO4				M	S							
CO5				M	S							

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I **9**

Robotics – Introduction–Basic Structure– Classification of robot and Robotic systems –laws of robotics – robot motions – work space, precision of movement.
Drives and control systems: Hydraulic systems, power supply – servo valve – sump – hydraulic motor – DC servo motors – stepper motors – operation.
Mechanical Components of Robots: Power transmission systems: Gear transmission. Belt drives, cables, Roller Chains, Link – Road Systems, Rotary to linear motion conversion, Rack and pinion drives, ball bearing screws, speed reducers, Harmonic drives.

UNIT II **10**

Kinematics of Robot: Introduction, Matrix Representation, Homogeneous transformation, forward and inverse Kinematics, Inverse Kinematics Programming, Degeneracy, dexterity, velocity and

static forces, velocity transformation force control systems, Basics of Trajectory planning.

UNIT III **8**

Robot End Effectors: Types of end effectors – Mechanical grippers – Types of Gripper mechanisms – Grippers force analysis – Other types of Grippers – Vacuum cups – Magnetic Grippers – Adhesive Grippers – Robot end effector interface.
Sensors: Position sensors – Potentiometers, encoders – LVDT, Velocity sensors, Acceleration Sensors, Force, Pressure and Torque sensors, Touch and Tactile sensors, Proximity, Range and sniff sensors, RCC, VOICE recognition and synthesizers.

UNIT IV **9**

Machine Vision: Introduction – Image processing Vs image analysis, image Acquisition, digital Images – Sampling and Quantization – Image definition, levels of Computation.
Image processing Techniques: Data reduction – Windowing, digital conversion. Segmentation – Thresholding, Connectivity, Noise Reduction, Edge detection, Segmentation, Region growing and Region Splitting, Binary Morphology and grey morphology operations.

UNIT V **9**

Feature Extraction: Geometry of curves – Curve approximation, Texture and texture analysis, Image resolution – Depth and volume, Color processing, Object recognition by features, Depth measurement, specialized lighting techniques. Segmentation using motion – Tracking. Image Data Compression, Real time Image processing, Application of Vision systems.

TOTAL NO .OF PERIODS: 45

Text Book:

1. M.P. Groover, Industrial Robotics – Technology, Programming and Applications, McGraw-Hill, USA, 2008. 2nd Edition.

References :

1. Saeed B. Niku, Introduction to Robotics: Analysis, Systems, Applications, 2nd edition, Pearson Education India, PHI 2003 (ISBN 81-7808-677-8)
2. Ramesh Jam, Rangachari Kasturi, Brain G. Schunck, Machine Vision, Tata McGraw-Hill, 1991. 1st Edition.
3. Yoremkoren, Robotics for Engineers, McGraw-Hill, USA, 1987.
4. P.A. Janaki Raman, Robotics and Image Processing, Tata McGraw-Hill, 1991.

BAM705 AUTOMOTIVE ELECTRONICS 3 0 0 3

OBJECTIVE:

- ❖ To introduce the automotive electronics for various features.
- ❖ To learn the student with various sensors, actuators, and engine control
- ❖ To introduce chassis and safety systems

Course Outcomes

CO01 - To introduce the automotive electronics with Euro rules and charging system
CO02 – To study about the engine basics, ignition and injection systems.
CO03 – To know the characteristics of various sensors and actuarors.
CO04 – To understand the concept of engine management system and CAN standard.
CO05 - To learn the safety system in automotive electronics.

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					S							
CO2					S							
CO3		M		M	S							
CO4					S							
CO5					S							

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I INTRODUCTION 8

Evolution of electronics in automobiles – emission laws – introduction to Euro I, Euro II, Euro III, Euro IV, Euro V standards – Charging systems – working and design of charging circuit diagram – starter motors and starter circuits.

UNIT II BASICS OF ENGINES 10

Operating principles of IC engine – major engine components – engine cylinder arrangements – the ignition systems – Electronic ignition, direct ignition, injection systems – working of the carburetor – throttle body injection – Multipoint fuel injection – sequential fuel injection.

UNIT III SENSOR AND ACTUATORS 7

Working principle and characteristics of Airflow rate, Engine crankshaft angular position, Hall effect, Throttle angle, temperature, exhaust gas oxygen sensors – study of fuel injector, exhaust gas recirculation actuators, stepper motor actuator, vacuum operated actuator.

UNIT IV ENGINE CONTROL SYSTEMS 10

Control modes for fuel control-engine control subsystems – ignition control methodologies – different ECU's used in the engine management – block diagram of the engine management system – In vehicle networks: CAN standard, format of CAN standard – diagnostics systems in modern automobiles.

UNIT V CHASSIS AND SAFETY SYSTEMS 10

Traction control system – Cruise control system – electronic control of automatic transmission – antilock braking system – electronic suspension system – working of airbag and role of MEMS in airbag systems – centralized door locking system – climate control of cars.

TOTAL NO .OF PERIODS: 45

Text Book :

1. TOM DENTON, "Automobile Electrical and Electronics Systems", Edward Arnold Publishers, 2000. 4th Edition.

References :

1. William B. Ribbens, "Understanding Automotive Electronics", 7th edition, Newnes Publishing, 2000.
2. Barry Hollembeak, "Automotive Electricity, Electronics & Computer Controls", Delmar Publishers, 2001.
3. "Fuel System and Emission controls", Check Chart Publication, 2000.
4. Ronald. K. Jurgon, "Automotive Electronics Handbook", McGraw-Hill, 1999. 2nd edition.

BMA701 OPERATIONS RESEARCH FOR ENGINEERS 3 1 0 4

Course Objectives

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

Course Outcomes:

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: Solve queuing problems with single and multiple channels.
CO5: Make decisions for replacement of equipments under stochastic situations.

CO/PO Mapping

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

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			M	M		S			S	S	S
CO2	S	M		W		W		W	S		S	S
CO3	S	M		M	S		S		W			M
CO4	S	M	S			W	S		W		S	
CO5	S	S			M		M			S	S	

Course Assessment methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

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 INVENTROY AND REPLACEMENT MODELS 12

Inventory models- Types of Inventory and variables in the Inventory problem – deterministic models- Replacement models – Replacement of items that deteriorate with time – equipment that fails completely and their analysis – factors for evaluation of proposals of capital expenditures and comparison and alternatives – present value average investment – rate of return pay off period – individual and group replacement policy.

UNIT – IV QUEUEING MODELS 12

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

UNIT –V DECISION MODELS 12

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

Total No. of Periods : 60

.

TEXT BOOKS :

1. KantiSwarup, Gupta, P.K and Manmohan, "Operations Research", Sultan Chand & Sons 1997

References:

1. Handy A. Taha, "Operations Research", 7thEdn. Prentice Hall of India. 2007.
2. Gupta and Hira DS " Operations Research", S. Chand & Co, New Delhi, 2006

BME7L3 CAD/CAM LAB 0 0 4 2

LIST OF EXPERIMENTS

1. Solid modeling using Ideas / Pro Engineering / CATIA software of gives components / products such as (at least 3 components)
2. Analysis of engineering problems using FEA package (at least 3 problems)
3. Exercise in surface machining – Multi Axis Machining and software Development for manufacturing. (at least 3 jobs)
4. Computer assisted part programming using Master Computer Software for various internal and external curved surface machining.

TOTAL NO .OF PERIODS: 60

LIST OF EQUIPMENT (for a batch of 30 students)

1. Any CAD software – 10 licenses
2. Any FEA software – 5 licenses
3. Any CAM software – 10 licenses

BMT7L3 ROBOTICS LAB 0 0 4 2

OBJECTIVE:

- To study of different types of robots based on configuration and application
- To practice on verification of transformation
- To practice on accuracy, repeatability and resolution .
- To practice robotics programming exercise

Course Outcomes

CO01 – To practices different types of robots based on configuration and application
CO02 – To study of different type of links and joints used in robots
CO03 – Verification of transformation (Position and orientation) with respect to gripper and world coordinate system
CO04 – To practices on programming exercises

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				S	M	W						
CO2				S	M	W						
CO3				S	M	W						
CO4				S	M	W						

Course Assessment Methods:

Direct	Indirect

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

LIST OF EXPERIMENTS

1. Study of different types of robots based on configuration and application.
2. Study of different type of links and joints used in robots
3. Study of components of robots with drive system and end effectors.
4. Determination of maximum and minimum position of links.
5. Verification of transformation (Position and orientation) with respect to gripper and world coordinate system
6. Estimation of accuracy, repeatability and resolution.
7. Robot programming exercises
   (Point-to-point and continuous path programming)

TOTAL NO .OF PERIODS: 45

LIST OF EQUIPMENT (for a batch of 30 students)

S.No	Name of the Equipment/components	No. of Items
1	Any one type of robot configuration with at least five degree of freedom.	1 set
2	Robot programming software inclusive of computer system.	10 licenses
3	Models of different types of end effectors drive systems Links and Joints.	5 each
4	Models of different configuration robots	5 each

BMT7P1 MECHATRONICS SYSTEM DESIGN & FABRICATION PROJECT 0 0 4 2
(Mini-project)

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

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

The item chosen may be control elements (like control applications) automotive appliances, agricultural implements, simple electronic applications, hydraulic/pneumatic devices etc.

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

List of example Mechatronics systems are given below:

1. Cantilever beam force measurement system.
2. Controlling temperature of a hot/cold reservoir.
3. Pick and place robot.
4. Car park barriers.
5. Car engine management system.
6. Testing of transportation bridge surface materials.
7. Solenoid force displacement calibration system.

TOTAL NO .OF PERIODS: 90

BMT7L4 COMPREHENSION 0 0 3 1

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 short answer type questions.

TOTAL NO .OF PERIODS: 45

BMT7V1 Inplant Training (End of 6th –Sem 15 days) 0 0 0 1

BMT8P1 PROJECT WORK 0 0 18 6

The objective of the project work is to enable the students in convenient groups of not more than 4 members on a project involving theoretical and experimental studies related to the branch of study. Every project work shall have a guide who is the member of the faculty of the institution. Six periods per week shall be allotted in the time table and this time shall be utilized by the students to receive the directions from the guide, on library reading, laboratory work, computer analysis or field work as assigned by guide and also to present in periodical seminars on the progress made in the project.

Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, project work details and conclusion. This final report shall be typewritten form as specified in the guidelines. The continuous assessment shall be

made as prescribed in the regulations.

TOTAL NO .OF PERIODS: 263

ELECTIVES

BMT002 INTEGRATED CIRCUITS 3 0 0 3

OBJECTIVE:

- To introduce the concept of Integrated Circuits
- To acquaint the student with various concepts used in integrated circuits
- To introduce the Various new technology in Integrated Circuits

Course Outcomes

CO01 - To learn the characteristics of op-amp & its fundamentals
CO02 – To understand the various application of op-amp
CO03 – To learn the various types of digital to analog and analog to digital converters
CO04 – To learn the concept of Special IC's and Voltage regulator.
CO05 - To learn the concept of phase logged loop and function generator

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	W			S							
CO2	S	M			S		W					
CO3	S	M			S							
CO4	S	M			S							
CO5	S	M			S							

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I CHARACTERISTICS OF OPAMP & ITS FUNDAMENTALS 9

Ideal OP-AMP characteristics, DC characteristics, AC characteristics, offset voltage and current:

voltage series feedback and shunt feedback amplifiers, differential amplifier; frequency response of OP-AMP; Basic applications of opamp - summer, differentiator and integrator, V/I &I/V converter.

UNIT II APPLICATIONS OF OPAMP 9

Sign Changer, Scale Changer, Phase Shift Circuits, Logarithmic amplifier, Precision rectifier, Instrumentation amplifier, Comparators, multivibrators, Schmitt trigger, waveform generators, clippers, clampers, peak detector, S/H circuit, First and Second order active filters, Low-pass, high-pass and band-pass Butterworth filters

UNIT III ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS 9

Analog and Digital Data Conversions, D/A converter – specifications – weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode R - 2R Ladder types - switches for D/A converters, high speed sample-and-hold circuits, A/D Converters – specifications – Flash type – Successive Approximation type – Single Slope type – Dual Slope type – A/D Converter using Voltage-to- Time Conversion – Over-sampling A/D Converters.

UNIT IV SPECIAL ICs & VOLTAGE REGULATORS 9

555 Timer circuit - Functional block, characteristics & applications; 566-voltage controlled oscillator circuit, OP-Amp Voltage regulator-Series, Shunt and switching regulator.

UNIT V ANALOG MULTIPLIER AND PLL 9

Analog Multiplier using Emitter Coupled Transistor Pair – Gilbert Multiplier cell – Variable transconductance technique, analog multiplier ICs and their applications, Operation of the basic PLL, Closed loop analysis, Monolithic PLL IC 565, application of PLL for AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing.

TOTAL NO. OF PERIODS: 45

TEXT BOOKS

1. Ramakant AGayakward, "Op-amps and Linear Integrated Circuits", IV edition, Pearson Education/ PHI , 2003.
2. Roy Choudhary.D, Sheil BJani, "Linear Integrated Circuits", II edition, New Age, 2003.
3. Morris Mano.M, "Digital Logic and Computer Design" Published by Delhi Pearson,2009.
4. Robert FCoughlin, Fredrick F.Driscoll, "Op-amp and Linear ICs", Pearson Education, 4th edition, / PHI 2002.

REFERENCES

1. David A.Bell, "Op-amp & Linear ICs", Prentice Hall of India, 4th edition,2002.
2. Charles H.Roth, "Fundamentals Logic Design", Jaico Publishing, 6th edition, 2006.
3. Floyd, "Digital Fundamentals", 10th edition, Pearson Education, 2008.

BCS001 C and Object Oriented Programming 3 0 0 3

OBJECTIVE:

- ❖ To introduce the concept of various programming language
- ❖ To acquaint the student with various concepts used in C and object oriented programming
- ❖ To introduce the various new technology in programming software

Course Outcomes

CO01 - To learn the concept about C programming language
CO02 – To understand the concept about array and structures in C
CO03 – To learn the concept about object oriented programming
CO04 – To learn the concept about encapsulation
CO05 - To learn the concept about polymorphism

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		W			S							
CO2		W			S							
CO3		W		M	S							
CO4		W			S							
CO5		W		M	S							W

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I 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 II ARRAYS AND STRUCTURES 9

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

UNIT III FUNDAMENTALS OF OBJECT ORIENTED PROGRAMMING 9

Object–Oriented Programming concepts – Encapsulation – Programming Elements – Program Structure – Enumeration Types — Functions and Pointers – Function Invocation – Overloading Functions – Scope and Storage Class – Pointer Types – Arrays and Pointers – Call–by–Reference – Assertions – Standard template library.

UNIT IV IMPLEMENTING ADTS AND ENCAPSULATION 9

Aggregate Type struct – Structure Pointer Operators – Unions – Bit Fields – Data Handling and

Member Functions – Classes – Constructors and Destructors – Static Member – this Pointer – reference semantics.

UNIT V POLYMORPHISM 9

ADT Conversions – Overloading – Overloading Operators – Unary Operator Overloading – Binary Operator Overloading – Function Selection – Pointer Operators – Visitation – Iterators – containers – Sequence Containers - List – List Iterators – Associative Containers.

TOTAL NO. OF PERIODS: 45

Text books:

1. *Yashavant P. Kanetkar, "Let us C",13th Edition, BPB Publications(2013).*
2. *E Balagurusamy, "C - Programming ", 3 edition, 2004, Tata McGraw Hill*
3. *E Balagurusamy, "Object oriented Programming with C++", 3 edition, 2006, Tata McGraw Hill*
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)*

BEC001 NEURAL NETWORKS AND FUZZY LOGIC SYSTEMS 3 0 0 3

OBJECTIVE:

- To introduce the neural network.
- To study about associative memories.
- To study about fuzzy logic system.

Course Outcomes

CO01 - To learn basics of neural networks.
CO02 – To learn about feed forward neural network.
CO03 – To learn about associative memories
CO04 – To learn about classical and fuzzy sets.
CO05 - To learn about application of neural networks and fuzzy logic.

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			S			M						
CO2			S							S	S	
CO3		M		S								
CO4					M	S					S	

CO5							S	S			S	

Course Assessment Methods:

Direct		**Indirect**	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I INTRODUCTION TO NEURAL NETWORKS 9

Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN. Essentials of Artificial Neural Networks. Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Learning Strategy . (Supervised, Unsupervised, Reinforcement), Learning Rules.

UNIT II FEED FORWARD NEURAL NETWORKS: 9

Single Layer Feed Forward Neural Networks- Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Limitations of the Perceptron Model. Multilayer Feed forward Neural Networks-Credit Assignment Problem, Generalized Delta Rule, Derivation of Backpropagation (BP) Training, Summary of Backpropagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements.

UNIT III ASSOCIATIVE MEMORIES 9

Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory, Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function.
Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis.

UNIT IV CLASSICAL & FUZZY SETS 9

Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions. Fuzzy Logic System Components. Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

UNIT V APPLICATIONS 9

Neural network applications: Process identification, control, fault diagnosis.
Fuzzy logic applications: Fuzzy logic control and Fuzzy classification.

TOTAL NO. OF PERIODS: 45

Text Book:

1. S. Rajasekharan and G. A. Vijayalakshmi pai, "Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications", PHI Publication, 2004.

2. John Yen and Reza Langan, "Fuzzy Logic: Intelligence, Control and Information", Pearson Education, 2004.

Reference Books:

1. *Simon Haykin, "Neural Networks- A comprehensive foundation", Pearson Education, 2001.2nd Edition.*
2. S.N.Sivanandam, S.Sumathi,S. N. Deepa "Introduction to Neural Networks using MATLAB 6.0", TMH, 2006.
3. James A Freeman and Davis Skapura, Neural Networks Pearson Education, 2002.
4. Timothy J. Ross, " Fuzzy Logic With Engineering Applications", McGraw-Hill Inc. 1997.3rd Ed.

BMT001 EMBEDDED SYSTEM AND DESIGN 3 0 0 3

OBJECTIVE:

- To study embedded hardware
- To study about embedded microcomputer systems
- To study about the real time operating system

Course Outcomes

CO01 - To learn review of embedded hardware
CO02 – To learn about microchip pic micro controller
CO03 – To learn embedded microcomputer systems
CO04 – To learn about software development
CO05 - To understand the real time operating systems

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			S			M						
CO2			S							S	S	
CO3		M		S								
CO4					M	S					S	
CO5							S	S			S	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I REVIEW OF EMBEDDED HARDWARE 9

Gates – Timing diagram – Memory – Microprocessors Buses – Direct Memory Access – Interrupts – Built-in functions on the Microprocessor – Conventions used on Schematic – schematic. Interrupts Microprocessor Architecture – Interrupt basics – Shared data Problem – Interrupt latency.

UNIT II MICROCHIP PIC MICRO CONTROLLER 9

Introduction, CPU Architecture – Registers – Instruction sets addressing modes – Loop timing – Timers – Interrupts, Interrupt timing, I/O Expansion, I^2C Bus Operation Serial EEPROM, Analog to Digital converter, UART – Baud Rate – Data Handling – Initialization, special features- Serial Programming – Parallel Slave Port.

UNIT III EMBEDDED MICROCOMPUTER SYSTEMS 9

Motorola MC68H11 Family Architecture, Registers, Addressing modes Programs, Interfacing methods parallel I/O interface, parallel port interfaces, Memory Interfacing, High Speed I/O Interfacing, Interrupts – Interrupt service routine – Features of interrupts – Interrupt vector and Priority, Timing Generation and Measurements, Input capture, Output compare, frequency Measurement, Serial I/O devices RS 232, RS485.

UNIT IV **SOFTWARE DEVELOPMENT 9**

Round Robin, Round robin with Interrupts, function – Queue – Scheduling Architecture, Algorithms. Introduction to – Assembler – Compiler – Cross Compilers and Integrated Development Environment (IDE) Object Oriented Interfacing, Recursion, Debugging strategies, Simulators.

UNIT V **REAL TIME OPERATING SYSTEMS 9**

Task and Task States, Tasks and Data, Semaphores and Shared Data Operating System services – Message Queues – Timer function – Events – Memory Management, Interrupt Routines in an RTOS environment, Basic design using RTOS.

TOTAL NO .OF PERIODS: 45

Text Books :

1. Jonarthan W. Valvano "Embedded Microcomputer Systems", Real Time Interfacing", Thomson learning, 2001.3rd Edition.

References :

1. David E. Simon, "An Embedded Software Primer", Pearson Education Asia, 2001.
2. John B Pitman, "Design with PIC Micro controllers", Pearson Education Asia, 1998.
3. Burns, Alan and Wellings, "Real – Time Systems and Programming Languages", second edition. Harlow: Addison Wesley – Longman, 1997.
4. Grehan Moore and Cyliax, "Real Time Programming: A guide to 32 bit Embedded Development", Addison Wesley – Longman, 1998.
5. Heath Steve, "Embedded Systems Design", Newnes, 1997.2nd Edition.

BET801 MEDICAL MECHATRONICS 3 0 0 3

OBJECTIVE:

- ❖ To study about transducers.
- ❖ To study about medical support devices.
- ❖ To study about diagnostic instruments.

Course Outcomes

CO01 - To learn basics about electrodes.
CO02 – To learn about transducers in medical mechatronics.
CO03 – To learn about amplifiers &recorders.
CO04 – To learn about medical support devices.
CO05 - To understand the biomedical diagnostic instrument.

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			S			M						
CO2			S							S	S	
CO3		M		S								
CO4					M	S					S	
CO5							S	S			S	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT 1 INTRODUCTION 9

Cell structure – electrode – electrolyte interface, electrode potential, resting and action potential – electrodes for their measurement, ECG, EEG, EMG – machine description – methods of measurement – three equipment failures and trouble shooting.

UNIT 1I TRANSDUCERS FOR BIO-MEDICAL INSTRUMENTATION 9

Basic transducer principles Types – source of bioelectric potentials – resistive, inductive, capacitive, fiber-optic, photoelectric and chemical transducers – their description and feature applicable for biomedical instrumentation – Bio & Nano sensors & application

UNIT 1II SIGNAL CONDITIONING, RECORDING AND DISPLAY 9

Input isolation, DC amplifier, power amplifier, and differential amplifier – feedback, op-Amp-electrometer amplifier, carrier Amplifier – instrument power supply. Oscillagraphic – galvanometric - X-Y, magnetic recorder, storage oscilloscopes – electron microscope – PMMC writing systems – Telemetry principles – Bio telemetry.

UNIV IV MEDICAL SUPPORT 10

Electrocardiograph measurements – blood pressure measurement: by ultrasonic method – plethysonography – blood flow measurement by electromagnetic flow meter cardiac output measurement by dilution method – phonocardiography – vector cardiography. Heart lung machine – artificial ventilator – Anesthetic machine – Basic ideas of CT scanner – MRI and ultrasonic scanner – Bio-telemetry – laser equipment and application – cardiac pacemaker – DC – defibrillator patient safety - electrical shock hazards. Centralized patent monitoring system.

UNIV IV BIO-MEDICAL DIAGNOSTIC INSTRUMENTATION 8

Introduction – computers in medicine – basis of signal conversion and digital filtering data reduction technique – time and frequency domain technique – ECG Analysis.

TOTAL NO .OF PERIODS: 45

Text Books :

1. Khandpur, R.S., "Handbook of Biomedical Instrumentation", TMH, 1989.2nd Edition.
2. Arumugam M., "Bio Medical Instrumentation", Anuradha agencies Pub., 2002.2nd Edition

References :

1. Geddes L.A., and Baker, L.E., "Principles of Applied Bio-medical Instrumentation", 3rd Edition, John Wiley and Sons, 1995.
2. Cromwell, Weibell and Pfeiffer, "Biomedical Instrumentation and Measurements", 2nd Edition, Prentice Hall of India, 1999.
3. Tompkins W.J., "Biomedical Digital Signal Processing: Principles and Techniques", Prentice Hall of India, 1998.

BMT005 MEMS AND NANOTECHNOLOGY 3 0 0 3

OBJECTIVE:

- To introduce the MEMS and nano technology for micro fabrication.
- To learn manufacturing concepts of micro sensors and actuators
- To introduce the nano level manufacturing

Course Outcomes

CO01 - To introduce various micro sensors and emergence of micro machines.
CO02 – To study about various materials for micro and nano fabrication
CO03 – To know various micro fabrication methods.
CO04 – To understand the concept of nano scale and technology
CO05 - To learn nano scale manufacturing

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				M	S							
CO2				M	S							

CO3				M	S							
CO4				M	S							
CO5				M	S							

Course Assessment Methods:

Direct		**Indirect**	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I **9**

Introduction: Historical background development of microelectronics, evolution of micro sensors, MEMS, emergence of micro machines.

Micro sensors: Introduction, thermal sensors, mechanical sensors, flow sensors and Introduction to SAW DEVICES

UNIT II **9**

MEMS materials and processing: Overview, metals, semiconductors, ceramic, polymeric and composite materials.

Microstereolithography: Introduction, Scanning Method, Projection Method, Applications. LIGA Process: Introduction, Basic Process and Application.

UNIT III **9**

Micro System Fabrication Processes: Photolithography, Chemical Vapor Deposition, Etching, Bulk and Surface Micro Manufacturing.

NANO-TECHNOLOGY

UNIT IV **9**

Introduction to Nanotechnology: The nanoscale. Consequences of the nanoscale for technology and society. - Technologies for the Nanoscale, Top-down versus bottom-up assembly. Visualisation, manipulation and characterisation at the nanoscale, Proximal probe technologies. Self-assembly.

UNIT V **9**

Nanoscale Manufacturing: Nanomanipulation, Nanolithography - An introduction to tribology and its industrial applications - Nanoscale Materials and Structure, Nanocomposites, Safety issues with nanoscale powders - Applications, Applications in energy, informatics, medicine, etc

TOTAL NO OF PERIODS: 45

Text Books:

1. ***Mark Ratner & Daniel Ratner, Nano Technology, Pearson Education,2003.***
2. *Tai – Ran Hsu, " MEMS & MICROSYSTEMS Design and Manufacturing", TATA McGRAW-HILL, 2002*
3. *S.M. Sze, Semiconductor Sensors, John Wiley & Sons, INC., 1994.*

References:

1. *Marc J. Madou, "Fundamentals of Microfabrication", II Edition, CRC Press, 2002.*
2. *Mohamed Gad-el-Hak, The MEMS Handbook, CRC Press, 2002*
3. *M.Elwenspoek, R.Wiegerink, Mechanical Microsensors, Springer-Verlag Berlin Heidelberg, 2001.*
4. *David Ferry, Transport in Nanostructures, Cambridge University Press, 2000.2nd Edition.*
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*

BMT003 ARTIFICIAL INTELLIGENCE 3 0 0 3

OBJECTIVE:

- To introduce the artificial intelligence
- To study of knowledge representation
- To study about the structural representation

Course Outcomes

CO01 - To learn pattern recognition
CO02 – To learn about game playing
CO03 – To learn knowledge representation
CO04 – To learn about knowledge representation using other logic
CO05 - To learn structural representation of knowledge

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			S			M						
CO2			S							S	S	
CO3		M		S								
CO4					M	S					S	
CO5							S	S			S	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I INTRODUCTION 10

Definition – Pattern recognition – Criteria of success – Production Systems – Control Strategies – Heuristic Search – Problem Characteristics – Production System Characteristics – Forward and backward reasoning – Matching Indexing – Heuristic Functions, Search algorithms.

UNIT II GAME PLAYING 8

Overview – Minimax search procedure – Adding Alpha – Beta cutoffs – Waiting for Ouiescence – Secondary search – Using book moves.

UNIT III KNOWLEDGE REPRESENTATION 10

Use of Predicate logic – Introduction to representation – representing simple facts in logic augmenting the representation – resolution – Conversion to clause from – The basis of resolution Unification of algorithm – Question answering – Natural Deduction.

UNIT IV KNOWLEDGE REPRESENTATION USING OTHER LOGICS 8

Nonmonotonic reasoning – Statistical Probabilistic reasoning – Techniques for dealing with a random world and deterministic world – rule based system.

UNIT V STRUCTURAL REPRESENTATIONS OF KNOWLEDGE 9

Common knowledge structures – level of representation – Right structures – Declarative representations – Semantic nets – Conceptual dependency Frames Scripts – Procedural representation – Natural language understanding – Perception – learning – Implementation A.I. Systems.

TOTAL NO .OF PERIODS: 45

Text Books :

1. *ELAINE RICH, Artificial Intelligence, McGraw-Hill Book Co., 3rd Edition, 2008.*

References :

1. *M. W. RICHAUGH, Artificial Intelligence, A. Knowledge Based Approach, PWS Rent Publishing Boston, 1998.*
2. *CHARNIAC. E and M.C.DERMOTT. Introduction to Artificial Intelligence, Addison Wesley Publishing Company, 2002.*
3. *ROBERT GOODELL BROWN, Materials Management Systems – A Members Library John Wiely Publishers, 1977.*
4. *WESTING FINE and ZONE, Purchasing Management Principles, John Wiley Publishers, 1986.*

BMT004 VIRTUAL INSTRUMENTATION 3 0 0 3

OBJECTIVE:

- ❖ To introduce the Virtual Instrument
- ❖ To study of LabVIEW
- ❖ To study about image processing

Course Outcomes

CO01 - To introduce the virtual instrumentation
CO02 – To learn about LabVIEW
CO03 – To learn array operation
CO04 – To learn basic DAQ hardware and software
CO05 - To learn image acquisition

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1			S			M						
CO2			S							S	S	
CO3		M		S								
CO4					M	S					S	
CO5							S	S			S	

Course Assessment Methods:

Direct		**Indirect**	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I **9**

Historical perspective and traditional bench-top instruments - General functional description of a digital instrument- Block diagram of a Virtual Instrument – Physical quantities and analog interfaces- Hardware and Software – User Interfaces –Advantages of Virtual Instruments over conventional instruments – Architecture of a Virtual Instruments and its relation to the operating system.

UNIT II **9**

LabVIEW – graphical user interfaces- controls and Indicators – ‘G’ programming –data types – data flow programming –Editing Debugging and Running a Virtual Instrument –Graphical programming palettes and tools – Front panel objects – Function and Libraries.

UNIT III **9**

FOR Loops, WHILE loops, Shift Registers, CASE structure, formula nodes-Sequence structures-Arrays and Clusters- Array operations – Bundle, Unbundle – Bundle/Unbundle by name, graphs and charts – string and file I/O – High level and Low level file I/Os – attribute nodes local and global variables.

UNIT IV **9**

Basics of DAQ Hardware and Software – Concepts of Data Acquisition and terminology – Installing Hardware, Installing drivers -Configuring the Hardware – addressing the hardware in LabVIEW- Digital and Analog I/O function – Buffered I/O – Real time Data Acquisition.

UNIT V **9**

Simple programs in VI- Advanced concepts in LabVIEW- TCP/IP VI's, Synchronization – other elements of Virtual Instrumentation – Bus extensions – PXI - Computer based instruments - Image acquisition –Motion Control.

TOTAL NO .OF PERIODS: 45

Text Books :

1. *Garry M. Johnson "LabVIEW Graphical Programming", Tata McGraw-Hill, 4th Edition, 2006*
2. Lisa.K.Wills, "LabVIEW for Everyone" Prentice Hall of India, 1996.

References :

1. *Labview Basics I and II Manual, National Instruments, 2003*
2. Barry Paton, "Sensor, Transducers and Lab VIEW", Prentice Hall, 2000.

BMT006 CONSUMER ELECTRONICS 3 0 0 3

OBJECTIVE:

- To understand the operation of audio, video systems.
- To learn the operation of various memory devices.
- To understand the performance of various switching systems.
- Able to conduct experiments on electrical machines and analyze the experimental data

Course Outcomes

CO01 - To learn various sound systems like stereophonic, Quadraphonic, recording
CO02 - To learn various video systems like cameras, VCR, VCP, TV etc
CO03 – To study various memory devices like CD, HDD etc
CO04 – To learn switching system in telephone exchange
CO05 - To study the home appliances like oven, Refrigerators, washing machines

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)

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

Course Assessment Methods:

Direct		**Indirect**	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I AUDIO SYSTEM 10

Hi-Fi systems, stereophonic sound system, public address systems, Acoustics, Quadraphonic sound systems, Graphics Equalizer, Electronic tuning, Digital sound recording on tape and disc..

UNIT II VIDEO SYSTEMS 4

B & W TV, colour TV and HD TV systems, Electric cameras, VCR, VCP, Block diagram and principles of working of cable TV and DTH, cable TV using internet.

UNIT III MEMORY DEVICES 12

CD systems, Memory diskettes, Discs and drums vide monitoring audio, video recording media & Systems.

UNIT IV SWITCHING SYSTEMS 10

Dolby noise reduction digital and analog recording. Switching Systems: Switching systems for telephone exchange, PAB EPRABX, modular telephones, Telephone message recording concepts, remix controlled systems.

UNIT V HOME APPLIANCES 9

Electronic toys, microwave oven, Refrigerators, washing machines, calculator, data organizers.

TOTAL NO .OF PERIODS: 45

TEXT BOOKS

1. Gulati.R.R, Monochrome and color television, New age publisher.2nd Edition

2. Encyclopedia of video & TV / Focal press

REFERENCES

1. Complete Satellite & cable Television R.R Gulati New age International Publisher.

2. Handbook of Electronics & Telecommunication.

BMT007 DIGITAL IMAGE PROCESSING 3 0 0 3

OBJECTIVE:

- To introduce the concept of Digital Image Processing
- To acquaint the student with various technique used in Digital Image Processing.
- To introduce the current trends in Digital images and its Processing

Course Outcomes

CO01 - To learn Fundamentals of Digital Images
CO02 – To understand the concept of image enhancement in special domain
CO03 – To learn the concept of image enhancement in frequency domain
CO04 – To learn the various methods of image compression
CO05 - To learn the various methods of image segmentation

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				M	S							
CO2	W				S		W					
CO3				M	S							
CO4	W				S		M					
CO5				S	S							

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I FUNDAMENTALS 8

What is Digital image processing, Examples (Briefly), Components of Image Processing System, Light and electromagnetic spectrum, Image Sensing and Acquisition, Simple Image Formation Model,
Image Sampling and Quantization:- Representing Digital Images, Spatial and Grey level Resolution, Basic Relationship Between Pixels.

UNIT II IMAGE ENHANCEMENT IN SPATIAL DOMAIN 9

Background, some Basic Grey Level Transformation:- Image Negatives, Log negatives,

Piecewise – Linear Transformation Functions:- Contrast stretching, Grey level Slicing, Bit Plane Slicing, Histogram processing: - Histogram Equalization, Histogram Specification, Local Enhancement.

UNIT III IMAGE ENHANCEMENT IN FREQUENCY DOMAIN 9

Two dimensional DFT and its Inverse, Filtering the frequency domain, Basics of filtering in frequency domain, smoothing and sharpening filters.
Color Image Processing:- Color Fundamentals and Color Models.

UNIT IV IMAGE COMPRESSION 9

Fundamentals, Coding Redundancy, Interpixel Redundancy Psycho-Visual Redundancy, Image Compression Models, Error Free Compression, Variable – Length Coding, Huffmann Coding, Arithmetic Coding, Run-length coding, Lossy Compression, Transform coding, JPEG.

UNIT V IMAGE SEGMENTATION 10

Detection of Discontinuous, Edge linking and Boundary Detection:- Local Processing, Thresholding:- Basic Global Thresholding, Region Based Segmentation:- Region Growing, Region Splitting and Merging, Use of Motion In Segmentation.

TOTAL NO .OF PERIODS: 45

Text Books:

1. *Digital image processing by Rafael C. Gonzale Z, Richard E.Words, Pearson Education, Asia,3rd Edition, 2008.*

References:

1. *Fundamental of Digital Image Processing by Anil. K. Jain, Prentice Hall of India Publishing Ltd., New Delhi, 2002. 7th Edition.*

BMT008 MICROELECTRONICS AND NANOELECTRONICS 3 0 0 3

OBJECTIVE:

- ❖ To introduce the micro electronics and explain the quantum mechanics
- ❖ To explain the various different types of component with micro structure
- ❖ To introduce the nano electronics
- ❖ To explain the molecular electronics

Course Outcomes

CO01 – To introduce the semiconductor physics and quantum electronics
CO02 – To explain the different types of junctions
CO03 – To explain the MOS structure
CO04 – To introduce and explain the nano electronics and its structure
CO05 - To explain the molecular electronics

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M			S							
CO2				M	S					M		

CO3				M	S					M		
CO4				M	S							
				M	S							

Course Assessment Methods:

Direct		**Indirect**	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT-I **9**

Introduction to semiconductor physics: Review of quantum mechanics, electrons in periodic lattices, E-k diagrams, Quasi-particles in semiconductors, electrons, holes and phonons. Boltzmann transport equation and solution in the presence of low electric and magnetic fields - mobility and diffusivity; carrier statistics; continuity equation, poisson's equation and their solution; high field effects: velocity saturation, hot carriers, avalanche breakdown, punch through and kirk effects.

UNIT-II **9**

Semiconductor junctions: Schottky, homo- and hetero-junction band diagrams and I-V characteristics, small signal switching models; two terminal and surface states devices based on semiconductor junctions. Bipolar transistor working, its charge control, and gummel poon model, structure of graded base, graded emitter transistor, hetro junction transistor.

UNIT-III **9**

MOS structures: Semiconductor surfaces; the ideal and non ideal MOS capacitor band diagrams and CVs; Effects of oxide charges, defects and interface states; characterization of MOS capacitors: HF and LF CVs, avalanche injection; high field effects and breakdown. Long & short channel effects.

NANOELECTRONICS

UNIT-IV **9**

Shrink-down approaches: Introduction, CMOS scaling, the nanoscale MOSFET, finfets, vertical. MOSFETs, limits to scaling, system integration limits (interconnect issues etc.), resonant tunneling transistors, single electron transistors, new storage, optoelectronic, and spintronics devices.

UNIT-V **9**

Atoms-up approaches: Molecular electronics involving single molecules as electronic devices, transport in molecular structures, molecular systems as alternatives to conventional electronics, molecular interconnects; Carbon nanotube electronics, bandstructure & transport, devices, mems applications.

TOTAL NO. OF PERIODS: 45

TEXT BOOK

1. *Millman and Grabel, "Microelectronics", 2nd Ed. Tata McGraw-Hill (2004).*
2. Hari Singh Nalwa, "Nanostructured Materials and Nanotechnology", Academic Press, 2002

REFERENCE BOOKS

1. *Sedra A S and Smith K C, "Microelectronic Circuits" 4th Ed., New York, Oxford University Press, New York (1997).*
2. Tocci R J and Widmer N S, "Digital Systems – Principles and Applications", 10th Ed., Pearson Education India, New Delhi (2001).
3.Cooper and Helfrick, "Modern Electronic Instrumentation and Measuring Techniques", 4th print Prentice Hall of India, New Delhi (1996).
4.Boylestad and Nashelsky, "Electronic Devices and Circuit Theory", 8th Ed, Pearson Education India, New Delhi (2002).
5. S.M. Kang & Y. Leblibici, "CMOS Digital Integrated Circuits-Analysis & Design", TMH, 3rd Ed. 2003.
6. A.Nabok, "Organic and Inorganic Nanostructures", Artech House, 200.
7. C.Dupas, P.Houdy, M.Lahmani, Nanoscience: "Nanotechnologies and Nanophysics", Springer-Verlag Berlin Heidelberg, 2007.

BBA051 MARKETING MANAGEMENT 3 0 0 3

OBJECTIVE:

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

Course Outcomes

CO01 - To learn marketing concepts between industry andconsumer.
CO02 – To learn about demographic factors.
CO03 – To study about pricing methods.
CO04 – To learn about portfolio analysis.
CO05 – To study about advertising and sales methods.

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M						S		S		
CO2	S									S	S	
CO3								S				
CO4			M			S						
CO5										S		

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		

6	End Semester Examinations		

UNIT I INTRODUCTION 9

Definition- Marketing Process- Dynamics- Needs- Wants and demands-Marketing Concepts- Environment- Mix- Types- Philosophies- Selling Vs Marketing- Organizational- Industrial Vs Consumer Marketing- Consumer Goods- Industrial Goods- Product Hierarchy.

UNIT II BUYING BEHAVIOUR & MARKET SEGMENTATION 9

Cultural- Demographic Factors- Motives- Types- Buying Decisions- Segmentation factors- Demographic- Psychographic & Geographic Segmentation- Process- Patterns.

UNIT III PRODUCT PRICING AND MARKETING RESEARCH 9

Objectives- Pricing- Decisions & Pricing Methods- Pricing Management- Introduction- Uses- Process of Marketing Research.

UNIT IV MARKETING PLANNING AND STRATEGY FORMULATION 9

Components of marketing plan- Strategy formulation and marketing process- Implementation- Portfolio analysis- BCG- GEC grids.

UNIT- V ADVERTISING, SALES PROMOTION AND DISTRIBUTION 9

Characteristics- Impact- Goals- Types- Sales promotion- Point of Purchase- Unique selling proposition- Characteristics- Whole selling- Retailing- Channel Design- Logistics- Modern trends in retailing.

TOTAL NO. OF PERIODS: 45

Text Books:

1. *Ramasamy and Nama kumari, "Marketing Environment: Planning, implementation and control the Indian context",2002*
2. *Govindarajan.M, "Industrial marketing management:", Vikas Publishing Pvt. Ltd, 2003*

References:

1. *Philip Kotler, Marketing Management, Analysis, Planning, Implementation and control, 1998.*
1. *Khanna O.P. – Industrial Engineering and Management, Khanna Publishers, New Delhi, 2000.*
2. *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

BBA052 PROFESSIONAL ETHICS 3 0 0 3

OBJECTIVE:

- To study about engineering ethics.
- To study ethics codes.
- To study about risk benefit analysis.

Course Outcomes

CO01 - To learn about ethical theories.
CO02 – To learn about codes of ethics.
CO03 – To study about assessment of safety and risk.
CO04 – To learn about responsibility and rights .
CO05 – To study about environmental ethics.

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			M				S		S		S	
CO2								S	S			
CO3												
CO4				M		S			S	S		
CO5		M					S					

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I ENGINEERING ETHICS 9

Human Values– Senses Of Engineering Ethics – Variety Of Moral Issues – Types Of Inquiry – Moral Dilemmas – Moral Autonomy – Kohlberg's And Gilligan's Theory – Consensus And Controversy – Models Of Professional Roles – Theories About Right Action –Self Interest – Customs And Religion – Use Of Ethical Theories.

UNIT II ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering As Experimentation – Engineers as Responsible Experimenters – Codes of Ethics - The Challenger, Case Study.

UNIT III ENGINEER'S RESPONSIBILITIES FOR SAFETY 9

Safety And Risk – Assessment Of Safety And Risk – Risk Benefit Analysis And Reducing Risk – The Three Mile Island , And Chernobyl Case Studies.

UNIT IV ENGINEERS'S RESPONSIBILITIES AND RIGHTS 9

Collegiality And Loyalty – Respect For Authority – Collective Bargaining – Confidentiality – Conflicts Of Interest – Occupational Crime – Whistle Blowing – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

UNIT V GLOBAL ISSUES 9

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development –Engineers As Managers – Consulting Engineers – Engineers As Expert Eye Witnesses And Advisors – Moral Leadership

TOTAL NO. OF PERIODS: 45

Text books:

1. *Mike W Martin and Roland Schinzinger, Ethics In Engineering, Tata Mcgraw Hill, Newyork,2nd Edition, 2009.*
2. *R S Nagaarazan, Textbook On Professional Ethics And Human Values, New Age International Publishers, 2006*

References:

1. *Laura Schlesinger, How Could You Do That? The Abdication Of Character, Couage, And Conscience, Harper Collins, Newyork 1996*
2. *Stephen Carter, Integrity, Basic Books, Newyork 1996*
3. *Charles D Fledderman, Engineering Ethics, Prentice Hall, New Mexico, 2004*

BBA054 INDIAN CONSTITUTION AND SOCIETY 3 0 0 3

OBJECTIVE:

- To introduce the Indian history and Indian constitution
- To study about prime minister, cabinet and parliament and supreme court
- To study about Indian Federal System and society

Course Outcomes

CO01 - To learn about Constituent Assembly of India
CO02 – To learn about Structures of the Union Government and Functions
CO03 – To study about State Government
CO04 – To learn about Indian Federal System .
CO05 – To study about Society

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			M			M			S	M		
CO2			M			M			S	M		
CO3			M			M			S	M		
CO4			M			M			S	M		
CO5			M						S	M		

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I **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 **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 **9**

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

UNIT IV **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 **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.

TOTAL NO. OF PERIODS: 45

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.

Reference:

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.

BBA055 ENGINEERING ECONOMICS AND COST ANALYSIS 3 0 0 3

OBJECTIVE:

know about engineering economics and cost analysis.

Course Outcomes

CO01- To learn about introduction to economics.
CO02- To learn about value engineering.
CO03- To learn about cash flow.
CO04- To learn about economics of sampling and Replacement and Maintenance analysis.
CO05- To learn about depreciation and Evaluation of public alternatives.

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S										
CO2	S	M	S									
CO3	M	M		S								
CO4	M		M	S								
CO5	S		S		M							

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

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.

TOTAL NO. OF PERIODS: 45

Text Books :

1. Panneer Selvam, 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. Donald.G. Newman, Jerome.P.Lavelle, "Engineering Economics and analysis" Engg. Press, Texas, 2002
3. Degarmo, E.P., Sullivan, W.G and Canada, J.R, Engineering Economy, Macmillan, New York, 1984.
4. Grant.E.L., Ireson.W.G., and Leavenworth, R.S, Principles of Engineering Economy, Ronald Press, New York,1976.
5. Smith, G.W., Engineering Economy, Lowa State Press, Iowa, 1973.

BBA056 PRODUCT DESIGN AND COSTING 3 0 0 3

OBJECTIVE:

To know about Product Design and Costing and Development

Course Outcomes

CO01- To learn about Criteria for product design and Product analysis.
CO02-To learn about economics of design.
CO03- To learn about product modeling and Types of product models.
CO04- To learn about product and Outline Process charts.
CO05- To learn about Fundamentals of FEM and and process design.

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

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

Course Assessment Methods:

Direct		**Indirect**	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I PRODUCT DESIGN AND DEVELOPMENT 8

Principles of creativity in design- integrated product development and concurrent engineering – Product analysis – Criteria for product design – Market research – Design for customer and design for manufacture – Product life cycle.

UNIT II ECONOMICS OF DESIGN 9

Breaks even point - Selection of optimal materials and processes – Material layout planning – Value analysis – Re-engineering and its impact on product development.

UNIT III PRODUCT MODELING 9

Product modeling – Definition of concept - fundamental issues – Role and basic requirement of process chains and product models –Types of product models – model standardization efforts – types of process chains – industrial demands.

UNIT IV PRODUCT COSTING 10

Bill of materials – Outline Process charts – Concepts of operational standard time - Work measurement by analytical estimation and synthesis of time – Budgets times – Labor cost and material cost at every stage of manufacture – W.I.P. costing

UNIT V RECENT ADVANCES AND CONCEPTS IN PRODUCT DESIGN 9

Fundamentals of FEM and its significance to product design – Product life cycle management – Intelligent information system – Concept of Knowledge based product and process design.

TOTAL NO. OF PERIODS: 45

Text Books:

1. KARL T. ULRICH, Stephen D. Eppinger – "Product Design and Development", McGraw-Hill, 2nd Edition 2009.

References:

1. HARRY NYSTROM, "Creativity and Innovation", John Wiley & Sons, 1979
2. GEORGE E. DIETER, "Engineering Design – Materials and process approach", Tata McGraw-Hill, 1991
3. DONALD E. CARTER, "Concurrent Engineering", Addison Wesley, 1992
4. SAMEUL EILON – "Elements of Production Planning and Control", McMillan and Company, 1962.
5. JONES S.W., "Product Dosing and Process Selection", Butterworth Publications, 1973.

BBA057 STATISTICAL QUALITY CONTROL 3 0 0 3

OBJECTIVE:

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

Outcomes:

CO01-To learn about Probability concepts and Quality costs.
CO02-To learn about control charts for variables.
CO03- To learn about control charts for attributes.
CO04- To learn about Economics of sampling and Problem Solving using it.
CO05- To learn about Pareto Analysis and quality improvement.

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			S				S			S		
CO2	M						S		S			
CO3		M				S						
CO4			S						S		S	
CO5	M					S						

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I INTRODUCTION 7

Probability concepts, Review of distribution: Normal, Poison's, and Binomial, Problems,

Measuring of quality and control, Value and quality, Quality costs, Quality assurance.

UNIT II CONTROL CHARTS FOR VARIABLES 10

Chance and assignable causes of quality variation, Control charts for variables, X-bar, R, and σ-charts, Warning and modified control limits, Process capability study, Ranges, Moving Averages, and Six σ- limits, multivariate charts.

UNIT III CONTROL CHARTS FOR ATTRIBUTES 8

Limitation of variable chart, p-chart, problems with variable sample size, np-chart, c- chart, u-chart, and ku-chart, Demerits per unit control chart.

UNIT IV ACCEPTANCE SAMPLING 10

Economics of sampling, Lot formation, OC-Curve-Producer's and Consumer's risk, Single and double sampling plans, AOQ, AOQL, ATI, ASN, Sequential sampling plan, MIL – STD – 1050 tables, MIL – STD – 414 tables, IS 2500 Standard.

UNIT V QUALITY IMPROVEMENT 10

Zero defects program, Quality circle, Fishbone diagram, scatter diagram, Pareto Analysis, Deming cycle, Introduction to Reliability function, System reliability of series, parallel, and combined configurations, Reliability improvement techniques.

TOTAL NO. OF PERIODS: 45

Text Books:

1. Grant E.L. and Leavensworth, "Statistical Quality Control", Tata McGraw-Hill Publishing Company, 2000.

References:

1. Douglas C. Montgomery, "Statistical Quality Control", John Wiley and Sons, 2001.
2. Fiegenbaum, A.V., "Total Quality Control", McGraw-Hill Inc., 1991.
3. Sharma S.C., "Inspection Quality Control and Reliability", Khanna Publishers, New Delhi (1998).
4. Srinath L.S "Reliability Engineering", Affiliated East west Press, 1998.

BBA058 ENTREPRENEURSHIP DEVELOPMENT 3 0 0 3

OBJECTIVE:

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

Course Outcomes

CO01 - To learn difference between entrepreneur and interpreneur.
CO02 – To learn about entrepreneurship development programs.
CO03 – To study about economic feasibility methods.
CO04 – To learn about taxation.
CO05 – To study about corrective measures methods.

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			S				S			S		
CO2	M						S		S			
CO3		M				S						
CO4			S						S		S	
CO5	M					S						

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I ENTREPRENEURSHIP 8

Entrepreneur- Types of Entrepreneurs - Difference Between Entrepreneur and Interpreneur- Role of Entrepreneurship in Economic Growth- Women and Rural Entrepreneurship - Factors Affecting Entrepreneurial Growth.

UNIT II MOTIVATION 8

Major Motives Influencing Entrepreneur – Achievement Motivation Training, Self Rating – Business Game – Thematic Apperception Test – Stress Management – Entrepreneurship Development Programs – Need, Objectives.

UNIT III BUSINESS 9

Small Enterprise – Definition, Classification – Characteristics- Ownership Structure – Project Formulation – Steps Involved in Setting up a Business – Identifying, Selecting a Good Business Opportunity- Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports- Project Appraisal- Sources of Information- Classification of Needs and Agencies.

UNIT IV FINANCING AND ACCOUNTING 10

Need – Sources of Finance- Terms Loans, Capital Structure- Financial Institutions, Management of Working Capital, Costing, Break Even Analysis, Network Analysis Techniques of PERT/ CPM –Taxation – Income Tax – Excise Duty – Sales Tax.

UNIT V SUPPORT TO ENTREPRENEURS 10

Sickness in Small Business- Concept, Magnitude, Causes and Consequences, Corrective Measures- Government Policy for Small Scale Enterprises- Growth Strategies in Small Industry – Expansion- Diversification, Joint Venture, Merger, Sub Contracting.

TOTAL NO. OF PERIODS: 45

Text Books:

1. *S.S.Khanka, "Entrepreneurial Development", S. Chand & Co. Ltd., Ram Nagar, New Delhi, 1999.*
2. *Hisrich RD and Peters MP, "Entrepreneurship", 7th Edition, Tata McGraw Hill, 2006.*

References:

1. *Rabindra Kanungo, "Entrepreneurship and Innovation" , Sage Publications, New Delhi, 1999*
2. *ED II. Faculty & External Experts-A Hand book for New Entrepreneurs Publishers: Entrepreneurial Development, Institute Of India, and Ahmedabad, 1986.*

BBA059 PROFESSIONAL ETHICS AND HUMAN VALUES 3 0 0 3

OBJECTIVE:

- To learn about moral of professional ethics.
- To study case studies of ethics.
- To study about employee rights.

Course Outcomes

CO01 - To learn senses of ethics.
CO02 – To learn about codes of ethics.
CO03 – To study about assessment of safety and risk.
CO04 – To learn about intellectual property rights.
CO05 – To study about moral leadership.

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M					S				S	S	
CO2		M				S	S			S		
CO3								S			S	
CO4						S				S		
CO5		M					S					

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I ENGINEERING ETHICS 9

Human Values– Senses Of Engineering Ethics – Variety Of Moral Issues – Types Of Inquiry – Moral Dilemmas – Moral Autonomy – Kohlberg's And Gilligan's Theory – Consensus And Controversy – Models Of Professional Roles – Theories About Right Action –Self Interest – Customs And Religion – Use Of Ethical Theories.

UNIT II ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering As Experimentation – Engineers as Responsible Experimenters – Codes of Ethics - The Challenger, Case Study.

UNIT III ENGINEER'S RESPONSIBILITIES FOR SAFETY 9

Safety And Risk – Assessment Of Safety And Risk – Risk Benefit Analysis And Reducing Risk – The Three Mile Island , And Cher Nobyl Case Studies.

UNIT IV ENGINEERS'S RESPONSIBILITIES AND RIGHTS 9

Collegiality And Loyalty – Respect For Authority – Collective Bargaining – Confidentiality – Conflicts Of Interest – Occupational Crime – Whistle Blowing – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

UNIT V GLOBAL ISSUES 9

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development –Engineers As Managers – Consulting Engineers – Engineers As Expert Eye Witnesses And Advisors – Moral Leadership

TOTAL NO. OF PERIODS: 45

Text books:

1. Mike W Martin and Roland Schinzinger, Ethics In Engineering, Tata Mcgraw Hill, Newyork 2005.

2. R S Nagaarazan, Textbook On Professional Ethics And Human Values, New Age International Publishers, 2006

3. Charles D Fledderman, Engineering Ethics, Prentice Hall, New Mexico, 2004

References:

1. Laura Schlesinger, How Could You Do That? The Abdication Of Character, Couage, And Conscience, Harper Collins, Newyork 1996

2.Stephen Carter, Integrity, Basic Books, Newyork 1996

BBA060 PRINCIPLES OF MANAGEMENT AND ORGANIZATIONAL BEHAVIOUR 3 0 0 3

OBJECTIVE:

- ❖ To learn about moral of professional ethics.
- ❖ To study case studies of ethics.
- ❖ To study about employee rights.

Course Outcomes

CO01 - To learn senses of Management
CO02 – To learn about codes of Management.
CO03 – To study about assessment of safety and risk.
CO04 – To learn about intellectual property rights.
CO05 – To study about Organizational Behavior

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M					S				S	S	
CO2		M				S	S			S		
CO3				M		S		S			S	
CO4						S				S		
CO5		M					S					S

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I **9**

Nature of management – definition – theory and practice – effective management – Management: Science of Art – Management in India. Development of Management thoughts – Taylor's – Henry Fayol – Hawthrone experiment – Barnard & Social system – Herbert Simon – Peter Drucker – Various approaches – Management thoughts.

UNIT II **9**

Management process and co-ordination – Functions of management – Managers and environment – External and internal Business Ethics – Planning – Fundamentals – Definitions & Features – Steps in planning – types of planning – Objectives – Concepts and features – Hierachy of objectives – role – Process of MBO – Policy & Strategy – Decision making process – Individual Vs Group Decisions.

UNIT III **9**

Organizing – Theory & Approach – Organization Structure – Authority & Responsibility – Delegation – Centralization & Decentralization – Line & Staff Relationship – Staffing – Fundamentals – System approach – Manpower Planning – Recruitment & Selection – Training and development – Performance appraisal – Direction – Fundamentals Motivation – Theories of Motivation-Maslow's Hersberg's MaClelland's theory X,Y & Z leadership – Theories and Styles – Communication – Type – Controlling – System and Process.

UNIT IV **9**

Organizational Behaviour – Definition – Organization – Managerial Role and Functions – Organizational Approaches, Individual behaviour – Causes – Environmental effect – Behaviour and performance, perception – Organizational implications, Personality – Contributing factors – Dimension, Motivation – Need Theories – Process Theories – Job satisfaction, Learning and Behaviour – Learning Curves, Work Design and Approaches.

UNIT V **9**

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

TOTAL NO. OF PERIODS: 45

Text books:

1. *Uma Sekaran, "Organizational Behaviour", Tata McGraw Hill, 2007.*

References:

1. *Herald Knootz and Heinz weihrich, 'Essentials of Management', McGraw Hill publishing Company, Singapore International Edition, 2004.*
2. *Ties AF, Stoner and R. Edward Freeman, "Management" Prentice Hall of India Pvt. Ltd., New Delhi -110011, 1995.*
3. *Joseph I. Massie 'Essentials of Management', Prentice Hall of India Pvt. Ltd., New Delhi -110011, 2004.*
4. *L.M. Prasad "Principles and Practice of Management", Sultan Chand & Sons.2001*

BMT061 **TOTAL QUALITY MANAGEMENT AND RELIABILITY ENGINEERING** **3 0 0 3**

OBJECTIVE:

- To introduce the concept of quality management and reliability for the industrial field
- To acquaint the student with various technique used in quality management
- To introduce the various new trends in quality management

Course Outcomes

CO01 - To learn the concept of quality planning
CO02 – To understand the various techniques for total quality management
CO03 – To learn the various system components of TQM
CO04 – To learn the concept of reliability in TQM
CO05 - To learn the various technique for time maintainability

CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				M		W				W	S	W
CO2			W	M		W					S	
CO3			W	M						M	S	
CO4				M		W				W	S	
CO5				M		W					S	W

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I BASIC CONCEPTS ON QUALITY PLANNING 9

Definition of Quality – Deming – Miller – Crosby Theories – Service & Product Quality – Customer Orientation – Quality Control – Evolution of TQM – Inspection –QC- Planning – Smart Goal Setting – Design for Quality- Manufacturing for Quality.

UNIT II TQM TECHNIQUES 9

Scientific Based Approach to TQM, Data Based Approach –Statistical Methods– Quality Control Tools–New 7 Tools. Bench Marking–Definition–Types–Steps–Metrics–Case Studies-Quality Function Development–Definition–House of Quality– Preliminary Research to Conduct QFD – QFD Matrix–Benefit –Case Studies–Failure Mode and Effect Analysis–5S-Continuous Improvement Techniques–Pokayoke–Deming Wheel-Case Studies.

UNIT III HUMAN DIMENSION & SYSTEM COMPONENT OF TQM 9

TQM Mind Set –Participation Style – Team Work – Team Development – Quality Circle-Motivational Aspect – Change Management.
Documentation – Structure – Information System – ISO 9000 – ISO 14000 – QS 9000 Certification Clauses –Procures – TQM Road – Map Criteria – Road Map – Evaluation.

UNIT RELIABILITY 9

Introduction – Difference between Quality and Reliability- Definition – Probabilistic Nature of Failures – Mean Failure Rate – Mean Time to Failure – Mean Time between Failures – Hazard Rate – Hazard Models – Weibull Model – Improvement in System Reliability by Redundancy – Series – Parallel and Mixed Configurations.

UNIT V MAINTAINABILITY 9

Introduction – Difference between Maintainability and Serviceability – Maintenance Strategy – Mean Time to Repair (MTTR) – Mean Down Time (MDT) – Fault Diagnosis- Routine Test for Unrevealed Faults- Factors Contributing to Mean Maintenance to Time (MMT) – Periodic Condition Monitoring – Continuous Condition Monitoring – Economics of Maintenance.

TOTAL NO. OF PERIODS: 45

Text Books:

1. *John Bank, Total Quality Management, Prentice Hall of India Pvt. Ltd, New Delhi 2000.*

Reference Books:

1. *Joel E. Rose, Total Quality Management – II Edition, Kogan Page Limited, USA 1993.*
2. *Samuel K Ho, TQM – An integrated Approach,II Edition, Kogan Page Ltd, USA 1993.*
3. *Charles Gervistz Developing New Products with TQM McGraw- Hill International Editions.*
4. *Dale H. Bester Field, Total Quality Management, Pearson Education, Low Price Edition, 2004.*
5. *Balagurusamy, E-Reliability Engineering, TMH, 1984.*
6. *Srinath I, Reliability Engineering, Affiliated East West Press, 1975.*