NATIONAL ENGINEERING COLLEGE

(An Autonomous Institution – Affiliated to Anna University Chennai)

K.R.NAGAR, KOVILPATTI – 628 503

REGULATIONS – 2011

DEPARTMENT OF

ELECTRONICS AND INSTRUMENTATION ENGINEERING

CURRICULUM AND SYLLABI OF

B.E.- ELECTRONICS AND INSTRUMENTATION ENGINEERING

REGULATIONS 2011

CURRICULUM AND SYLLABI FOR FULL TIME

B.E. ELECTRONICS AND INSTRUMENTATION ENGINEERING

SEMESTER – I

Common to all B.E. / B.Tech. Degree Programmes

S.No	Course Code	Course Title	L	T	P	C
THEORY						
1.	BEG101	Technical English – I	3	1	0	4
2.	BMA101	Mathematics – I	3	1	0	4
3.	BPH101	Engineering Physics – I	3	0	0	3
4.	BCY101	Engineering Chemistry – I	3	0	0	3
5.	BCS101	Fundamentals of Computing and Programming	3	0	0	3
6.	BME101	Engineering Graphics	2	3	0	4
PRACTICAL						
7.	BCS131	Computer Practice Laboratory – I	0	0	3	2
8.	BPC131	Physics and Chemistry Laboratory –I	0	0	3	2
9.	BME131	Engineering Practices Laboratory	0	0	3	2
		Total Number of Credits :				**27**

SEMESTER – II

S.No	Course Code	Course Title	L	T	P	C
THEORY						
1.	BEG201	Technical English – II*	3	0	0	3
2.	BMA201	Mathematics – II*	3	1	0	4
3.	BPH201	Engineering Physics – II *	3	0	0	3
4.	BCY201	Engineering Chemistry – II *	3	0	0	3
5. a.	BME201	Engineering Mechanics (For Mechanical & Civil branches)	3	1	0	4
b.	BEE201	Circuit Theory (For EEE & EIE branches)	3	1	0	4
c.	BEC201	Electric Circuits and Electron Devices (For CSE, IT & ECE branches)	3	1	0	4
6. a.	BEE202	Basic Electrical & Electronics Engineering (For Mechanical & Civil branches)	4	0	0	4
b.	BME202	Basic Civil & Mechanical Engineering (For CSE, IT, EEE, EIE & ECE branches)	4	0	0	4
PRACTICAL						
7.	BCS231	Computer Practice Laboratory – II*	0	1	2	2
8.	BPC231	Physics & Chemistry Laboratory – II*	0	0	3	2
9. a.	BME231	Computer Aided Drafting and Modeling Laboratory (For Mechanical & Civil branches)	0	1	2	2
b.	BEE231	Electrical Circuits Laboratory (For EEE & EIE branches)	0	0	3	2
c.	BEC231	Circuits and Devices Laboratory (For ECE, CSE & IT branches)	0	0	3	2
10.	BEG231	English Language Skill Laboratory* (Skill of Listening)	0	0	3	2
		Total Number of Credits :				**29**

- *** Common to all B.E. / B.Tech. Programmes**

SEMESTER – III

S.No	Course Code	Course Title	L	T	P	C
THEORY						
1	BMA301	Transforms and Partial Differential Equations	3	1	0	4
2	BCE301	Environmental Science and Engineering	3	0	0	3
3	BEE305	Electrical Machines	3	0	0	3
4	BEI301	Electrical Measurements	3	1	0	4
5	BEI302	Electronic Devices and Circuits	3	0	0	3
6	BCS304	Data Structures and Algorithms	3	0	0	3
PRACTICAL						
7	BEI331	Electronic Devices and Circuits Laboratory	0	0	3	2
8	BEE334	Electrical Machines Laboratory	0	0	3	2
9	BCS334	Data Structures and Algorithms Laboratory	0	0	3	2
10	BEG331	Communication Skills and Technical Seminar - I	0	0	3	2
		TOTAL	18	2	12	28

SEMESTER – IV

S.No	Course Code	Course Title	L	T	P	C
THEORY						
1	BEI401	Industrial Instrumentation - I	3	0	0	3
2	BEI402	Transducer Engineering	3	0	0	3
3	BEI403	Digital Circuits	3	1	0	4
4	BEE402	Control Systems	3	1	0	4
5	BEI404	Linear Integrated Circuits and Applications	3	0	0	3
6	BME404	Applied Thermodynamics	3	1	0	4
PRACTICAL						
7	BEI431	Transducers and Measurements Laboratory	0	0	3	2
8	BEI432	Linear and Digital Integrated circuits Laboratory	0	0	3	2
9	BME433	Thermodynamics Laboratory	0	0	3	2
10	BEG431	Communication Skills and Technical Seminar - II	0	0	3	2
		TOTAL	18	3	12	29

SEMESTER – V

S.No	Course Code	Course Title	L	T	P	C
THEORY						
1	BEI501	Industrial Instrumentation - II	3	0	0	3
2	BEI502	Digital System Design	3	1	0	4
3	BEI503	Microprocessor and Microcontroller Programming	3	1	0	4
4	BEI504	Communication Systems	3	0	0	3
5	BCS302	Object Oriented Programming	3	0	0	3
6	BGE501	Professional Ethics and Human values	3	0	0	3
PRACTICAL						
7	BEI531	Microprocessor and Microcontroller Programming Laboratory	0	0	3	2
8	BCS332	Object Oriented Programming Laboratory	0	0	3	2
		TOTAL	**18**	**2**	**6**	**24**

SEMESTER – VI

S. No	Course Code	Course Title	L	T	P	C
THEORY						
1	BEI601	Analytical Instrumentation	3	0	0	3
2	BEI602	Modern Electronic Instrumentation	3	0	0	3
3	BEI603	Process Control	3	1	0	4
4	BEI604	Digital Signal Processing Systems	3	1	0	4
5		Elective - I	3	0	0	3
6		Elective - II	3	0	0	3
PRACTICAL						
7	BEI631	Industrial Instrumentation and Telemetry Laboratory	0	0	3	2
8	BEI632	Computer Control of Process Laboratory	0	0	3	2
		TOTAL	**18**	**2**	**6**	**24**

SEMESTER – VII

SL. No.	Course Code	Course Title	L	T	P	C
THEORY						
1	BEI701	Embedded Systems and Programming	3	1	0	4
2	BEI702	Virtual Instrumentation	3	0	0	3
3	BEI703	Logic and Distributed Control System	3	1	0	4
4	BMG601	Principles of Management	3	0	0	3
5		Elective – III	3	0	0	3
6		Elective – IV	3	0	0	3
PRACTICAL						
7	BEI731	Logic and Distributed Control System Laboratory	0	0	3	2
8	BEI732	Embedded Systems and Virtual Instrumentation Laboratory	0	0	3	2
9	BEI733	Comprehension	0	0	3	1
		TOTAL	**18**	**2**	**9**	**25**

SEMESTER – VIII

SL. No.	Course Code	Course Title	L	T	P	C
THEORY						
1	BEI801	Power Plant Instrumentation	3	0	0	3
2	BEI802	Biomedical Instrumentation *(Common to EIE, EEE)*	3	0	0	3
3		Elective – V	3	0	0	3
4		Elective – VI	3	0	0	3
PRACTICAL						
5	BEI831	Project Work	0	0	18	12
		TOTAL	**12**	**0**	**18**	**24**

SEMESTER VI (ELECTIVE I & II)

SL. No.	Course Code	Course Title	L	T	P	C
1	BEI001	Industrial Drives and Control	3	0	0	3
2	BEI002	Industrial Data Networks	3	0	0	3
3	BEI003	Metrology	3	0	0	3
4	BEI004	Mechatronics	3	0	0	3
5	BEI005	Micro Electro Mechanical Systems	3	0	0	3
6	BEI006	VLSI System Design	3	0	0	3
7	BEI007	Digital Control System	3	0	0	3
8	BIT005	Visual Programming	3	0	0	3
9	BGE001	Organizational Behaviour	3	0	0	3

SEMESTER VII (ELECTIVE III & IV)

SL. No.	Course Code	Course Title	L	T	P	C
1	BEI021	Fiber Optics and Laser Instruments	3	0	0	3
2	BEI022	Image Processing	3	0	0	3
3	BEI023	Applied Soft Computing	3	0	0	3
4	BEI024	Sensor Networks	3	0	0	3
5	BEI025	Testing and Calibration of Instruments	3	0	0	3
6	BEI026	Non-Destructive Testing	3	0	0	3
7	BME014	Fundamentals of Nano Technology	3	0	0	3
8	BMA001	Numerical Methods with programming in C for Engineers	3	0	0	3
9	BGE002	Industrial Safety Engineering	3	0	0	3

SEMESTER VIII (ELECTIVE V & VI)

SL. No.	Course Code	Course Title	L	T	P	C
1	BEI041	PC based Instrumentation	3	0	0	3
2	BEI042	Aircraft Instrumentation	3	0	0	3
3	BEI043	Advanced Process Control	3	0	0	3
4	BEI044	Industrial Automation and Control	3	0	0	3
5	BEI045	Robotics and Automation *(Common to EIE,EEE)*	3	0	0	3
6	BEI046	Medical Informatics	3	0	0	3
7	BEI047	Automotive Instrumentation and Control	3	0	0	3
8	BEI048	Instrumentation in Petrochemical Industries	3	0	0	3
9	BIT014	Computer Architecture	3	0	0	3
10	BMG701	Total Quality Management	3	0	0	3

BEG101   **TECHNICAL ENGLISH – I**   **L T P C**

                                                                                            3 1 0 4

UNIT I   **12**
General Vocabulary – Changing words from one form to another – Adjectives, Comparative adjectives – Active and Passive voice – Tenses – simple present, present continuous – Nouns – compound nouns – Skimming and scanning – Listening and transfer of information – bar chart, flowchart – Paragraph writing, description – Discussing as a group and making an oral report on the points discussed, Conversation techniques – convincing others.

Suggested activities:
1. Matching words & meanings - Using words in context – Making sentences.
2. Changing sentences from active to passive voice & vice versa.
3. Skimming, cloze exercises, exercises transferring information from text to graphic form – bar charts, flow charts.
4. Writing descriptions using descriptive words & phrases, and technical vocabulary.
5. Role play, conversation exercises, discussions, oral reporting exercises.
Any other related relevant classroom activity.

UNIT II   **12**
Vocabulary – prefixes & suffixes – simple past tense – Spelling and punctuation – 'wh' Question forms – Scanning, inference – Listening & note-taking – Paragraph writing – Comparison and contrast – Creative thinking and speaking.

Suggested Activities:

1. a. Vocabulary activities using prefixes and suffixes.
   b. Exercises using questions – asking & answering questions.
2. Scanning the text for specific information.
3. Listening and note-taking – Writing paragraphs using notes, giving suitable headings and subheadings for paragraphs. Using expressions of comparison and contrast.
4. Discussion activities and exploring creative ideas.
Any other related relevant classroom activity.

UNIT III   **12**
Tenses – simple past, simple future and past perfect – Reading in Context – Reading & note-making – single line – Definitions – sequencing of sentences – instruction writing – Persuasive speaking.

Suggested activities:

1. Providing appropriate context for the use of tenses
2. Listening and note-taking
3. (a) Writing sentence definitions and instructions
   (b) Identifying the discourse links and sequencing jumbled sentences.
4. Speaking exercises, discussions, role play exercises using explaining, convincing and persuasive Strategies.
Any other related relevant classroom activity.

UNIT IV   **12**
Modal verbs and Probability – Concord subject verb agreement (Correction of errors) – Cause and effect expressions – Extended Definition – Speaking about the future plans.

Suggested activities:
1. a. Making sentences using modal verbs to express probability
    b. Gap filling using relevant grammatical form of words.
2. Writing extended definitions
3. Speaking – role play activities, discussions, extempore speaking exercises speculating
    about the future.
    Any other related relevant classroom activity

UNIT V   **12**
'If' conditionals – Gerunds – Intensive reading – Speaking – Presentation of problems & solutions – Itinerary – planning for an industrial visit – Formal Letter writing – Letter to the editor, invitation letter, accepting, declining letter and permission letter.

Suggested activities:
1. a) Sentence completion exercises using 'If' conditionals.
    b) Gap filling exercises using gerunds and present participle forms
2. Reading comprehension exercises.
3. Role play, discussion, debating and speaking activities for stating, discussing problems and suggesting solutions.
4. Writing letters to officials and to the editor in formal/official contexts.
    Any other related relevant classroom activity.

                                                                                            TOTAL: 60 PERIODS

AREAS TO BE COVERED UNDER DIFFERENT HEADINGS:

A) Language focus
1. Suffixes and Prefixes
2. Transformation of words from one form to another (Derivatives from root words)
3. Matching words & meanings (synonyms)
4. Compound nouns
5. Degrees of comparison
6. Active and passive voice-impersonal passive
7. Tenses: simple present, simple past, simple future, present continuous, past continuous, Present Perfect.
8. Modal verbs
9. 'Wh' Question forms
10. Conditional clause
11. Gerunds and infinitives
12. Expressing Cause and effect
13. Concord
14. Punctuation
15. Writing definitions

B) Reading
1. Reading in context
2. Skimming and scanning
3. Scanning the text for specific information
4. Reading and note-making
5. Intensive reading for making inferences
6. Reading comprehension

C) Listening:

1. Listening and transfer of information
2. Listening & note taking

D) Writing:

1. Transformation of information from graphical data to written form and from written form to graphical Form.
2. Paragraph writing – Description
3. Paragraph Writing – comparison and contrast.
4. Note-making
5. Writing Instructions
6. Jumbled sentences
7. Letter writing – Formal letters (Invitation, Accepting, Declining, Permission Letters) Letters to the editor

E) Speaking:

1. Discussing as a group and making oral reports,
2. Role play-Conversation techniques – convincing others
3. Creative thinking and speaking, Exploring creative ideas
4. Persuasive strategies
5. Speaking about the future plans
6. Extempore speech – Speaking exercises speculating about the future
7. Presentation of problems and solutions
8. Debates

TEXT BOOK

1. Department of Humanities & Social Sciences, Anna University, 'English for Engineers and Technologists' Combined Edition (Volumes 1 & 2), Chennai: Orient Longman Pvt. Ltd., 2006. Themes 1– 4 (Resources, Energy, Computer, Transport)

REFERENCES
1. Meenakshi Raman and Sangeeta Sharma, 'Technical Communication English skills for Engineers', Oxford University Press, 2008.
2. Andrea, J. Rutherford, 'Basic Communication Skills for Technology', 2nd Edition, Pearson Education, 2007.

*Extensive Reading***:**
A.P.J.Abdul Kalam with Arun Tiwari, 'Wings of Fire' An Autobiography, University Press (India) Pvt. Ltd.,1999, 30th Impression 2007.

BMA101   **MATHEMATICS – I**   **L T P C**
                                                                         3 1 0 4

UNIT I   MATRICES   **12**
Characteristic equation – Eigen values and eigen vectors of a real matrix – Properties – Cayley-Hamilton theorem (excluding proof) – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic form – Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT II   THREE DIMENSIONAL ANALYTICAL GEOMETRY   **12**
Equation of a sphere – Plane section of a sphere – Tangent Plane – Equation of a cone – Right circular cone – Equation of a cylinder – Right circular cylinder.

UNIT III   DIFFERENTIAL CALCULUS   **12**
Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes – Evolute as envelope of normals.

UNIT IV   FUNCTIONS OF SEVERAL VARIABLES   **12**
Partial derivatives – Euler's theorem for homogenous functions – Total derivatives – Differentiation of implicit functions – Jacobians – Taylor's expansion – Maxima and Minima – Method of Lagrangian multipliers.

UNIT V   MULTIPLE INTEGRALS   **12**
Double integration – Cartesian and polar coordinates – Change of order of integration – Change of variables between Cartesian and polar coordinates – Triple integration in Cartesian co-ordinates – Area as double integral – Volume as triple integral.

TOTAL: 60 PERIODS

TEXT BOOK
1. Bali N. P and Manish Goyal, "Text book of Engineering Mathematics", 3rd Edition, Laxmi Publications (P) Ltd., (2008).

REFERENCES
1. Grewal. B.S, "Higher Engineering Mathematics", 40th Edition, Khanna Publications, Delhi, (2007).
2. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, (2007).
3. Glyn James, "Advanced Engineering Mathematics", 7th Edition, Wiley India, (2007).
4. Jain R.K and Iyengar S.R.K, "Advanced Engineering Mathematics", 3rd Edition, Narosa Publishing House Pvt. Ltd., (2007).

BPH101	ENGINEERING PHYSICS – I	L T P C
		3 0 0 3

UNIT I   ULTRASONICS   9

Introduction – Production – magnetostriction effect – Magnetostriction generator– piezoelectric effect – piezoelectric generator – Detection of ultrasonic waves – properties – Cavitations – Velocity measurement – acoustic grating – Industrial applications – drilling, welding, soldering and cleaning – SONAR – Non Destructive Testing – pulse echo system through transmission and reflection modes – A,B and C – scan displays, Medical applications – Sonograms.

UNIT II   LASERS   9

Introduction – Principle of Spontaneous emission and stimulated emission, Population inversion, pumping, Einsteins A and B coeffcients – derivation. Types of lasers – He-Ne, CO_2, Nd-YAG, Semiconductor lasers (homojunction & heterojunction) Qualitative Industrial Applications - Lasers in welding, heat treatment, cutting – Medical applications – Holography (construction & reconstruction).

UNIT III   FIBER OPTICS & APPLICATIONS   9

Principle and propagation of light in optical fibres – Numerical aperture and Acceptance angle - Types of optical fibres (material, refractive index, mode) – Double crucible technique of fibre drawing – Splicing, Loss in optical fibre – attenuation, dispersion, bending – Fibre optical communication system (Block diagram) – Light sources – Detectors – Fibre optic sensors – temperature & displacement – Endoscope.

UNIT IV   QUANTUM PHYSICS   9

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

UNIT V   CRYSTAL PHYSICS   9

Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – NaCl, ZnS, diamond and graphite structures – Polymorphism and allotropy – Crystal defects – point, line and surface defects – Burger vector.

TOTAL: 45 PERIODS

TEXT BOOKS
1. R. K. Gaur and S.C. Gupta, 'Engineering Physics' Dhanpat Rai Publications, New Delhi (2003)
2. M.N.Avadhanulu and PG Kshirsagar, 'A Text book of Engineering Physics' S.Chand and company, Ltd., New Delhi, 2005.

National Engineering College (An Autonomous Institution, Affiliated to Anna University, Chennai), K.R.Nagar, Kovilpatti

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REFERENCES

1. Serway and Jewett, 'Physics for Scientists and Engineers with Modern Physics', 6th Edition, Thomson Brooks/Cole, Indian reprint (2007)
2. Rajendran, V and Marikani A, 'Engineering Physics' Tata Mc Graw Hill Publications Ltd, III Edition, New Delhi (2004).
3. Palanisamy, P.K., 'Engineering Physics' Scitech publications, Chennai (2007).
4. Jayakumar. S, 'Engineering Physics', R.K. Publishers, Coimbatore (2003).
5. Chitra Shadrach and Sivakumar Vadivelu, 'Engineering Physics', Pearson Education, New Delhi (2007).

BCY101   **ENGINEERING CHEMISTRY – I**   **L T P C**
                                                                           3 0 0 3

UNIT I   WATER TECHNOLOGY   9
Characteristics – alkalinity – types of alkalinity and determination – hardness – types and estimation by EDTA method (problems), Domestic water treatment – disinfection methods (Chlorination, ozonation. UV treatment) – Boiler feed water – requirements – disadvantages of using hard water in boilers – internal conditioning (phosphate, calgon and carbonate conditioning methods) – external conditioning – demineralization process – desalination and reverse osmosis.

UNIT II   POLYMERS AND COMPOSITES   9
Polymers – definition – polymerization – types – addition and condensation polymerization – free radical polymerization mechanism ,Plastics – classification – preparation, properties and uses of PVC, Teflon, polycarbonate, polyurethane, nylon-6,6, PET, Rubber – vulcanization of rubber, synthetic rubbers – butyl rubber, SBR, Composites – definition, types polymer matrix composites – FRP only.

UNIT III   SURFACE CHEMISTRY   9
Adsorption – types – adsorption of gases on solids – adsorption isotherms – Frendlich and Langmuir isotherms – adsorption of solutes from solution – role of adsorbents in catalysis, ion-exchange adsorption and pollution abatement.

UNIT IV   NON-CONVENTIONAL ENERGY SOURCES AND STORAGE DEVICES   9
Nuclear energy – fission and fusion reactions and 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 – alkaline batteries – lead-acid, nickel-cadmium and lithium batteries.

UNIT V   ENGINEERING MATERIALS   9
Refractories – classification – acidic, basic and neutral refractories – properties (refractoriness, refractoriness under load, dimensional stability, porosity, thermal spalling) – manufacture of alumina, magnesite and zirconia bricks, Abrasives – natural and synthetic abrasives – quartz, corundum, emery, garnet, diamond, silicon carbide and boron carbide. Lubricants – mechanism of lubrication, liquid lubricants – properties – viscosity index, flash and fire points, cloud and pour points, oilyness – solid lubricants – graphite and molybdenum sulphide. Nanomaterials – introduction to nanochemistry – carbon nanotubes and their Applications.

                                                                        TOTAL: 45 PERIODS

TEXT BOOKS
  1. P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub.Co., New Delhi (2002).
  2. S.S. Dara "A text book of engineering chemistry" S.Chand & Co. Ltd., New Delhi (2006).

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

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BCS101   FUNDAMENTALS OF COMPUTING AND PROGRAMMING   L T P C
                                                                                                                         3 0 0 3

UNIT I   INTRODUCTION TO COMPUTERS   9
Introduction – Characteristics of Computers – Evolution of Computers – Computer Generations – Classification of Computers – Basic Computer Organization – Number Systems.

UNIT II   COMPUTER SOFTWARE   9
Computer Software – Types of Software – Software Development Steps – Internet Evolution – Basic Internet Terminology – Getting connected to Internet – Applications.

UNIT III   PROBLEM SOLVING AND OFFICE AUTOMATION   9
Planning the Computer Program – Purpose – Algorithm – Flow Charts – Pseudocode –Application Software Packages – Introduction to Office Packages (not detailed commands for examination).

UNIT IV   INTRODUCTION TO "C"   9
Overview of **"C"** – Constants, Variables and Data Types – Operators and Expressions – Managing Input and Output operators – Decision Making –Branching and Looping.

UNIT V   FUNCTIONS AND POINTERS   9
Handling of Character Strings – User-defined functions – Definitions – Declarations – Call by reference – Call by value – Structures and Unions – Pointers – Arrays – The Preprocessor – Developing a **"C"** Program : Some Guidelines.

                                                                                              TOTAL: 45 PERIODS
TEXT BOOKS
1. Ashok.N.Kamthane, "Computer Programming", Pearson Education (India) (2008).
2. Behrouz A.Forouzan and Richard.F.Gilberg, "A Structured Programming Approach Using C", Second Edition, Brooks-Cole Thomson Learning Publications (2007).

REFERENCES
1. Pradip Dey and Manas Ghoush, "Programming in C", Oxford University Press (2007).
2. Byron Gottfried, "Programming with C", 2nd Edition, (Indian Adapted Edition), TMH publications (2006). (Unit II, III, IV, and V).
3. Stephen G.Kochan, "Programming in C", Third Edition, Pearson Education India (2005).
4. Brian W.Kernighan and Dennis M.Ritchie, "The C Programming Language", Pearson Education Inc. (2005).
5. E.Balagurusamy,"Computing fundamentals and C Programming", Tata McGRaw-Hill Publishing Company Limited (2008).
6. S.Thamarai Selvi and R.Murugan, "C for All", Anuradha Publishers (2008).

BME101   **ENGINEERING GRAPHICS**   **L T P C**
                                                                          2 3 0 4

UNIT I   PLANE CURVES AND FREE HAND SKETCHING   12
CURVES USED IN ENGINEERING PRACTICES:
Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

FREE HAND SKETCHING:
Representation of Three Dimensional objects – General principles of orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

UNIT II   PROJECTION OF POINTS, LINES AND PLANE SURFACES   12
Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – Projection of polygonal surface and circular lamina inclined to both reference planes.

UNIT III   PROJECTION OF SOLIDS   12
Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

UNIT IV   SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES   12
Sectioning of above solids in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other – Obtaining true shape of section. Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones – Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.

UNIT V   ISOMETRIC AND PERSPECTIVE PROJECTIONS   12
Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones, Combination of any two simple solids. Perspective projection of prisms, pyramids and cylinders by visual ray method and vanishing point method.
                                                                 TOTAL: 60 PERIODS

TEXT BOOK
   1. N.D. Bhatt, "Engineering Drawing" Charotar Publishing House, 46th Edition, (2003).

REFERENCES
   1. K.V.Natarajan, "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai (2006).
   2. M.S. Kumar, "Engineering Graphics", D.D. Publications (2007).
   3. K. Venugopal & V. Prabhu Raja, "Engineering Graphics", New Age International (P) Limited (2008).
   4. M.B. Shah and B.C. Rana, "Engineering Drawing", Pearson Education (2005).
   5. K. R. Gopalakrishnana, "Engineering Drawing" (Vol. I & II), Subhas Publications (1998).
   6. Dhananjay A.Jolhe, "Engineering Drawing with an introduction to AutoCAD" Tata McGraw Hill Publishing Company Limited (2008).
   7. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi (2008).

BCS131   **COMPUTER PRACTICE LABORATORY – I**   **L T P C**
                                                                                                       0 0 3 2

LIST OF EXERCISES
I. MS Office

a) WORD PROCESSING
1. Document creation, Text manipulation with Scientific notations.
2. Table creation, Table formatting and Conversion.
3. Mail merge and Letter preparation.
4. Drawing - Flow Chart.

b) SPREAD SHEET
1. Chart - Line, XY, Bar and Pie.
2. Formula - formula editor.
3. Spread sheet - inclusion of object, picture and graphics, protecting the document and sheet.
4. Sorting and Import / Export features.

II SIMPLE C PROGRAMMING
1. Data types, Expression evaluation, Conditional statements.
2. Arrays.
3. Structures and Unions.
4. Functions.

                                                                               TOTAL: 45 PERIODS

For programming exercises Flow chart and pseudocode are essential.

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 60 STUDENTS

HARDWARE
- LAN System with 66 nodes (OR) Standalone PCs – 66 Nos.
- Printers – 3 Nos.

SOFTWARE
- OS – Windows / UNIX Clone
- Application Package – Office suite
- Compiler – **"C"**

BPC131   PHYSICS AND CHEMISTRY LABORATORY – I   L T P C
0 0 3 2

PHYSICS LABORATORY – I

LIST OF EXPERIMENTS
1.   (a) Particle size determination using Diode Laser.
      (b) Determination of Laser parameters – Wavelength and angle of divergence.
      (c) Determination of acceptance angle in an optical fiber.
2.   Determination of thickness of a thin wire – Air wedge method.
3.   Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer.
4.   Determination of wavelength of mercury spectrum – spectrometer grating.
5.   Determination of thermal conductivity of a bad conductor – Lee's Disc method.
6.   Determination of Hysteresis loss in a ferromagnetic material.

B. CHEMISTRY LABORATORY – I

LIST OF EXPERIMENTS
1.   Estimation of hardness of Water by EDTA method.
2.   Estimation of Copper in brass by EDTA method.
3.   Determination of DO in water (Winkler's method)
4.   Estimation of Chloride in Water sample (Argentometric)
5.   Estimation of alkalinity of Water sample
6.   Determination of molecular weight and degree of polymerization using viscometry.

BME131   ENGINEERING PRACTICES LABORATORY   L T P C
0 0 3 2

GROUP A (CIVIL & MECHANICAL)

I CIVIL ENGINEERING PRACTICE
BUILDINGS:
> (a) 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 connections – Mixed pipe material connection – Pipe connections with different joining components.
> (e) Demonstration of plumbing requirements of high-rise buildings.

CARPENTRY USING POWER TOOLS ONLY:
> (a) Study of the joints in roofs, doors, windows and furniture.
> (b) Hands-on-exercise:
>   Wood work, joints by sawing, planing and cutting.

II MECHANICAL ENGINEERING PRACTICE

WELDING:
> (a) Preparation of arc welding of butt joints, lap joints and tee joints.
> (b) Gas welding practice.

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.

MACHINE ASSEMBLY PRACTICE:
> (a) Study of centrifugal pump.
> (b) Study of air conditioner.

DEMONSTRATION ON:
> (a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.
> (b) Foundry operations like mould preparation for gear and step cone pulley.
> (c) Fitting – Exercises – Preparation of square fitting and vee – fitting models.

GROUP B (ELECTRICAL & ELECTRONICS)

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

IV ELECTRONICS ENGINEERING PRACTICE
1. Study of Electronic components and equipments – Resistor colour coding, measurement of AC signal parameters (peak-peak value, rms value period, frequency) usindg CRO.
2. Study of logic gates AND, OR, EX-OR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor for HWR and FWR.

TOTAL: 45 PERIODS

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

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Curriculum & Syllabus for B.E. (EIE)   **Regulations-2011**

BEG201   TECHNICAL ENGLISH – II   **L T P C**
           (*Common to all branches*)   **3 0 0 3**

AIM

To encourage students to actively involve in participative learning of English and to help them acquire communication skills.

OBJECTIVES

1. To help the students to develop listening skills for academic and professional purposes.
2. To help the students to acquire the ability of effective speaking in English in real-life situations.
3. To inculcate reading habit and to develop effective reading skills.
4. To help the students to improve their active and passive vocabulary.
5. To familiarize the students with different rhetorical functions of scientific English.
6. To enable the students to write letters and reports effectively in formal and business situations.

UNIT I   **10**

Technical   Vocabulary –   meanings in context, sequencing words, Articles   – Prepositions, intensive reading and predicting content, Reading and interpretation, extended definitions, process description.

Suggested activities

1.   Exercises on word formation using the prefix 'self' – Gap filling with preposition Exercises – Using sequence words
2.   Reading comprehension exercise with questions based on inference – Reading heading and predicting the content – reading advertisements and interpretation
3.   Writing extended definitions – Writing description of processes – Writing paragraphs based on discussions – Writing paragraphs describing the future

UNIT II   **10**

Phrases / structure indicating cause/purpose – Adverbs – Skimming – Non-verbal communication – Listening – correlating verbal and non-verbal communication – speaking in group discussion – Formal Letter writing – Writing analytical paragraphs.

Suggested Activities

1.   Reading comprehension exercises with questions on overall content – Discussions analyzing stylistic features (creative and factual description) – Reading comprehension exercises with texts including graphic communication – Exercises in interpreting non-verbal communication.
2.   Listening comprehension exercises to categories data in tables.
3.   Writing formal letters – quotations, placing orders, clarification, and complaint, Letter seeking permission for industrial visits, writing analytical paragraphs on different debatable issues.

UNIT III   **10**

Cause and effect expressions – Different grammatical forms of the same word – speaking – stress and intonation, Group Discussions – reading – critical reading – listening – writing – using   connectives,   report   writing   –   types,   structure,   data collection, content, form, recommendations.

Suggested Activities

1. Exercises combining sentences using cause and effect expressions – Gap filling exercises using the appropriate tense forms – Making sentences using different grammatical forms of the same word.
2. Speaking exercises involving the use of stress and intonation – Group discussions – analysis of problems and offering solutions.
3. Reading comprehension exercises with critical questions, multiple choice questions.
4. Sequencing of jumbled sentences using connectives – Writing different types of reports like industrial accident report and survey report – writing recommendations.

UNIT IV   **10**

Numerical adjectives – Oral instructions – Descriptive writing – Argumentative paragraphs – Letter of application – content, format (CV/Bio-data) – instructions, imperative forms – preparing checklists, Yes/No question form – Email communication

Suggested Activities
1. Rewriting exercises using numerical adjectives.
2. Reading comprehension exercises with analytical questions on content – Evaluation of content.
3. Listening comprehension – entering information in tabular form, intensive listening exercise and completing the steps of a process.
4. Speaking – Role Play – group discussions – Activities giving oral instructions.
5. Writing descriptions, expanding hints – writing argumentative paragraphs – Writing formal letters – writing letter of application with CV/Bio-data – Writing general and safety instructions – Preparing checklists – Writing e-mail messages

UNIT V   **5**

Speaking – Discussion of problems and solutions – Creative and critical thinking – writing an essay, Writing a proposal.

Suggested Activities
1. Case Studies on problems and solutions
2. Brain storming and discussion
3. Writing Critical essays
4. Writing short proposals of 2 pages for starting a project, solving problems, etc.
5. Writing advertisements

TOTAL 45 periods

AREAS TO BE COVERED UNDER DIFFERENT HEADINGS

A. Language Focus
1. Technical vocabulary
2. Sequencing words
3. Articles
4. Prepositions
5. Word formation using prefixes
6. Phrases / Structure indicating purpose
7. Adverbs
8. Cause and effect expressions
9. Tense forms
10. Different grammatical forms of the same word
11. Numerical adjectives
12. Extended definitions

B. Reading

1. Intensive reading and predicting content
2. Reading and interpretation
3. Skimming
4. Critical reading
5. Reading comprehension exercises

C. Listening

1. Correlating verbal and non-verbal communication
2. Listening comprehension

D. Speaking

1. Group Discussions
2. Stress and intonation
3. Role plays and giving oral instructions
4. Discussion of problems and solutions

E. Writing

1. Process description
2. Formal letter writing
3. Writing analytical paragraphs
4. Report Writing
5. Descriptive writing
6. Argumentative paragraphs
7. Letter of application
8. Instructions
9. Recommendations
10. Checklists preparation
11. Email Communication
12. Writing critical essays
13. Writing proposals

TEXT BOOK

1. 'English for Engineers and Technologists' Combined Edition (Volumes 1 & 2), Department of Humanities & Social Sciences, Anna University, Chennai: Orient Longman Pvt. Ltd., 2006. Themes 5 – 8 (Technology, Communication, Environment, Industry)

REFERENCES

1. Mark Abbot son, "Technical English for professionals" (2009).
2. P.K. Dutt, G. Rajeevan and C.L.N Prakash, 'A Course in Communication Skills', Cambridge University Press, India 2007.
3. Krishna Mohan and Meera Banerjee, 'Developing Communication Skills', Macmillan India Ltd., (Reprinted 1994 – 2007).
4. Edgar Thorpe, Showick Thorpe, 'Objective English', Second Edition, Pearson Education, 2007.
5. Rodney Huddleston and Geoffrey Pullum, 'A students introduction to English Grammar', Cambridge University Press, 2007.
6. Jack C.Richards, Jonathan Hull and Susan Protor, 'English for International Communication', Third Edition, Cambridge University Press, 2004.

Extensive Reading:

1. Robin Sharma, 'The Monk Who Sold His Ferrari', Jaico Publishing House, 2007

Note:

The book listed under Extensive Reading is meant for inculcating the reading habit of the students. They need not be used for testing purposes.

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Curriculum & Syllabus for B.E. (EIE)   **Regulations-2011**

BMA201   **MATHEMATICS – II**   **L T P C**
                   (*Common to all branches*)   **3 1 0 4**

UNIT I   ORDINARY DIFFERENTIAL EQUATIONS   12
Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients.

UNIT II   VECTOR CALCULUS   12
Gradient Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and stoke's theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelpipeds.

UNIT III   ANALYTIC FUNCTIONS   12
Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy – Riemann equation and Sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping : w= z+c, cz, 1/z and bilinear transformation.

UNIT IV   COMPLEX INTEGRATION   12
Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Taylor and Laurent expansions – Singular points – Residues – Residue theorem – Application of residue theorem to evaluate real integrals – Unit circle and semi-circular contour(excluding poles on boundaries).

UNIT V   LAPLACE TRANSFORM   12
Laplace transform – Conditions for existence – Transform of elementary functions – Basic properties – Transform of derivatives and integrals – Transform of unit step function and impulse functions – Transform of periodic functions. Definition of Inverse Laplace transform as contour integral – Convolution theorem (excluding proof) – Initial and Final value theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

TOTAL: 60 PERIODS

TEXT BOOK
1. Bali N. P and Manish Goyal, "Text book of Engineering Mathematics", 3rd Edition, Laxmi Publications (P) Ltd., (2008).
2. Grewal.B.S, "Higher Engineering Mathematics", 40th Edition, Khanna Publications', Delhi (2007).

REFERENCES
1. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi (2007).
2. Glyn James, "Advanced Engineering Mathematics", 3rd Edition, Pearson Education (2007).
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 7th Edition, Wiley India (2007).
4. Jain R.K and Iyengar S.R.K, "Advanced Engineering Mathematics", 3rd Edition, Narosa Publishing House Pvt. Ltd., (2007).

BPH201   ENGINEERING PHYSICS – II   **L T P C**
(*Common to all branches*)   **3 0 0 3**

UNIT I   CONDUCTING MATERIALS   9

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

UNIT II   SEMICONDUCTING MATERIALS   9

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

UNIT III   MAGNETIC AND SUPERCONDUCTING MATERIALS   9

Origin of magnetic moment – Bohr magneton – Dia and para magnetism – Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – anti-ferromagnetic materials – Ferrites – applications – magnetic recording and readout – storage of magnetic data – tapes, floppy and magnetic disc drives. Superconductivity – Properties – Types of super conductors – BCS theory of superconductivity (Qualitative) - High Tc superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.

UNIT IV   DIELECTRIC MATERIALS   9

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

UNIT V   MODERN ENGINEERING MATERIALS   9

Metallic glasses: preparation, properties and applications. Shape Memory Alloys (SMA): Characteristics, properties of Ni-Ti alloy, application, advantages and disadvantages of SMA. Nanomaterials: synthesis – plasma arcing – chemical vapour deposition – sol-gels – electrodeposition – ball milling – properties of nanoparticles and applications. Carbon nanotubes: fabrication – arc method – pulsed laser deposition – chemical vapour deposition – structure – properties and applications.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Charles Kittel 'Introduction to Solid State Physics', John Wiley & sons 7th Edition, Singapore (2007)
2. Charles P. Poole and Frank J.Ownen, 'Introduction to Nanotechnology', Wiley India (2007) (for Unit V)

REFERENCES

1. G.Senthil Kumar, 'Engineering Physics – II' VRB Publishers Pvt Ltd., Chennai (2010)
2. B.N.Sankar and S.O.Pillai, 'Engineering Physics', New Age International Publishers (2008) New Delhi.
3. Jayakumar .S. 'Materials Science', R.K. Publishers, Coimbatore (2008).
4. Palanisamy.P.K, 'Materials Science', Scitech publications (India) Pvt.Ltd., Chennai, 2nd Edition (2007).
5. M. Arumugam, 'Materials Science' Anuradha Publications, Kumbakonam (2006).
6. Rajendran.V and Marikani.A, 'Materials Science' Tata McGraw Hill publications, New Delhi (2004).

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Curriculum & Syllabus for B.E. (EIE)   Regulations-2011

BCY201   ENGINEERING CHEMISTRY – II   L T P C
              (*Common to all branches*)   **3 0 0 3**

AIM

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

OBJECTIVES

1. The student should be conversant with the principles of electrochemistry, electrochemical cells, emf and applications of emf measurements.
2. Principles of corrosion control.
3 . Chemistry of Fuels and combustion.
4. Industrial importance of Phase rule and alloys.
5. Analytical techniques and their importance.

UNIT I   ELECTROCHEMISTRY   9

Electrochemical cells – reversible and irreversible cells – EMF – measurement of emf – Single electrode potential – Nernst equation (problem) – reference electrodes –Standard Hydrogen electrode – calomel electrode – Ion selective electrode – glass electrode and measurement of pH – electrochemical series – significance – potentiometric titrations (redox Fe^{2+} vs dichromate and precipitation – Ag+ vs Cl⁻ titration) and conductometric titrations – acid-base (HCl vs NaOH) titrations.

UNIT II   CORROSION AND CORROSION CONTROL   9

Chemical corrosion – Pilling-Bedworth rule – electrochemical corrosion – different types – galvanic corrosion – differential aeration corrosion – factors influencing corrosion – corrosion control – sacrificial anode and impressed current cathodic methods – corrosion inhibitors – protective coatings – paints – constituents and functions – metallic coatings – electroplating (Au) and electroless (Ni) plating.

UNIT III   FUELS AND COMBUSTION   9

Calorific value – classification – Coal – proximate and ultimate analysis – metallurgical coke – manufacture by Otto-Hoffmann by product oven method – Petroleum processing and fractions – cracking – catalytic cracking and methods. knocking – octane number and cetane number – synthetic petrol – Fischer Tropsch and Bergius processes – Gaseous fuels- water gas, producer gas, CNG and LPG – Flue gas analysis – Orsat apparatus – theoretical air for combustion.

UNIT IV   PHASE RULE AND ALLOYS   9

Statement and explanation of terms involved – one component system – water system – condensed phase rule – construction of phase diagram by thermal analysis – simple eutectic systems (lead-silver system only) – alloys – importance, ferrous alloys – nichrome and stainless steel – heat treatment of steel, non-ferrous alloys – brass and bronze.

UNIT V   ANALYTICAL TECHNIQUES   9

Beer-Lambert's law (problem) – UV-visible spectroscopy and IR spectroscopy – principles – instrumentation (problem) (block diagram only) – estimation of iron by Colorimetry. flame photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame photometry. atomic absorption spectroscopy – principles – instrumentation (block diagram only) – estimation of nickel by atomic absorption spectroscopy.

                                                        TOTAL: 45 PERIODS

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TEXT BOOKS
1. P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub. Co., New Delhi, 15th Edition (2009).
2. S.S.Dara "A text book of Engineering Chemistry" S.Chand & Co.Ltd., New Delhi (2006)

REFERENCES
1. A Text book of Physical Chemistry by A.S.Negi & S.C. Anand, New Age International Pvt. Ltd., New Delhi (2009)
2. B.Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd., New Delhi (2008)
3. Principles of Physical Chemistry, AR Puri, LR Sharma, M.S. Pathania, Vishal Publication, (2005)
4. B.K.Sharma "Engineering Chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2001)

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Curriculum & Syllabus for B.E. (EIE)   Regulations-2011

(a) BME201   **ENGINEERING MECHANICS**   **L   T   P C**
                            (For Mechanical & Civil Branches)   **3   1   0   4**

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 both in two dimensions and also in three dimensions. Further, he should understand the principle of work and energy. He should be able to comprehend the effect of friction on equilibrium. He should be able to understand the laws of motion, the kinematics of motion and the interrelationship. He should also be able to write the dynamic equilibrium equation. All these should be achieved both conceptually and through solved examples.

UNIT I   BASICS & STATICS OF PARTICLES   12

Introduction – Units and Dimensions – Laws of Mechanics – Lami's theorem, Parallelogram and triangular Law of forces – Vectors – Vectorial representation of forces and moments – Vector operations: additions, subtraction, dot product, cross product – Coplanar Forces – Resolution and Composition of forces – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility – Single equivalent force.

UNIT II   EQUILIBRIUM OF RIGID BODIES   12

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

UNIT III   PROPERTIES OF SURFACES AND SOLIDS   12

Determination of Areas and Volumes – First moment of area and the Centroid of sections – Rectangle, circle, triangle from integration – T section, I section, Angle section, Hollow section by using standard formula – second and product moments of plane area – Rectangle, triangle, circle from integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Polar moment of inertia – Principal moments of inertia of plane areas – Principal axes of inertia – Mass moment of inertia – Derivation of mass moment of inertia for rectangular section, prism, sphere from first principle – Relation to area moments of inertia.

UNIT IV   DYNAMICS OF PARTICLES   12

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion – Newton's law – Work Energy Equation of particles – Impulse and Momentum – Impact of elastic bodies.

UNIT V   FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS   12

Frictional force – Laws of Coloumb friction – simple contact friction – Rolling resistance – Belt friction. Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion.

TOTAL: 60 PERIODS

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, 9th edition (2010)

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REFERENCES

1. Rajasekaran.S, Sankarasubramanian.G., "Fundamentals of Engineering Mechanics", Vikas Publishing House Pvt. Ltd., 3rd Edition (2010).
2. Hibbeller, R.C., "Engineering Mechanics", Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd., 12th Edition (2010).
3. Irving H. Shames, "Engineering Mechanics – Statics and Dynamics", IV Edition – Pearson Education Asia Pvt. Ltd., (2003).
5. Ashok Gupta, "Interactive Engineering Mechanics – Statics – A Virtual Tutor (CDROM)", Pearson Education Asia Pvt., Ltd., (2002).
6. Palanichamy.M.S., Nagam, S., "Engineering Mechanics – Statics & Dynamics", Tata McGraw-Hill (2001).

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Curriculum & Syllabus for B.E. (EIE)   **Regulations-2011**

(b)   BEE201   CIRCUIT THEORY   L   T   P   C
**   (For EEE & EIE Branches)   3   1   0   4**

UNIT I   BASIC CIRCUITS ANALYSIS   12
Ohm's Law – Kirchoffs laws – DC and AC Circuits – Resistors in series and parallel circuits – Mesh current and node voltage method of analysis for D.C and A.C. circuits.

UNIT II   NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND
**   AC CIRCUITS   12**
Network reduction: voltage and current division, source transformation – star delta conversion. Thevenins and Norton Theorem – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem.

UNIT III   RESONANCE AND COUPLED CIRCUITS   12
Series and parallel resonance – their frequency response – Quality factor and Bandwidth – Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

UNIT IV   TRANSIENT RESPONSE FOR DC CIRCUITS   12
Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. input (Sinusoidal).

UNIT V   ANALYSING THREE PHASE CIRCUITS   12
Three phase balanced / unbalanced voltage sources – analysis of three phase 3-wire and 4- wire circuits with star and delta connected loads, balanced & unbalanced loads – phasor diagram of voltages and currents – power and power factor measurements in three phase circuits.
**   TOTAL: 60 PERIODS**

TEXT BOOKS
1. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", Tata McGraw Hill, (2007).
2. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuit Analysis", Tata McGraw Hill publishers, 6th edition, New Delhi, (2002).

REFERENCES
1. John Bird "Electrical Circuit Theory and Technology" Fourth Edition, Newnes   Publications (2010)
3. Charles K.Alexander, Mathew N.O.Sadik, "Fundamentals of Electric circuits", 2nd Edition, McGraw Hill (2003).
4. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, Tata McGraw-Hill, New Delhi (2001).
5. Paranjothi SR, "Electric Circuits Analysis," New Age International Ltd., New Delhi, (1996).
6. Chakrabati A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi (1999).

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Curriculum & Syllabus for B.E. (EIE)   Regulations-2011

(c) BEC201 ELECTRIC CIRCUITS AND ELECTRON DEVICES   **L T P C**
                      (For ECE, CSE and IT Branches)   **3 1 0 4**

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   12
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.

UNIT IV   TRANSISTORS   12
Principle of operation of PNP and NPN transistors – study of CE, CB and CC configurations and comparison of their characteristics – Breakdown in transistors – operation and comparison of N-Channel and P-Channel JFET – drain current equation – MOSFET – Enhancement and depletion types – structure and operation – comparison of BJT with MOSFET – thermal effect on MOSFET.

UNIT V   SPECIAL SEMICONDUCTOR DEVICES (Qualitative Treatment only)   12
Tunnel diodes, PIN diode, varactor diode – SCR characteristics and two transistor equivalent model – UJT – Diac and Triac – Laser, CCD, Photodiode, Phototransistor, Photoconductive and Photovoltaic cells – LED, LCD.

                                                                         TOTAL: 60 PERIODS
TEXT BOOKS
   1. Joseph A. Edminister, Mahmood, Nahri, "Electric Circuits" –   Shaum series, Tata McGraw Hill (2001)
   2. Salivahanan, N. Suresh kumar and A.Vallavaraj, "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. William H. Hayt, J.V. Jack, E. Kemmebly and Steven M. Durbin, "Engineering Circuit Analysis", Tata McGraw Hill (2011.)
   2. A.Sudhakar, Shyammohan S Palli, "Circuits and Networks-Analysis and Synthesis", Tata McGraw Hill, 4th edition (2010)
   3. Robert T.Paynter, "Introducing Electronics Devices and Circuits", Pearson Education, 7th Education (2008).
   4. J.Millman & Halkins, Satyebranta Jit, "Electronic Devices & Circuits", Tata McGraw Hill, 2nd Edition (2008).
   5. William H. Hayt, J.V. Jack, E. Kemmebly and steven M. Durbin, "Engineering Circuit Analysis", Tata McGraw Hill, 6th Edition (2002).

(a) BEE202   BASIC ELECTRICAL & ELECTRONICS ENGINEERING   L T P C
(For Mechanical & Civil Branches)   4 0 0 4

UNIT I   ELECTRICAL CIRCUITS & MEASURMENTS   12

Ohm's Law – Kirchoff's Laws – Steady State Solution of DC Circuits – Introduction to AC Circuits – Waveforms and RMS Value – Power and Power factor – Single Phase and Three Phase Balanced Circuits. Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters.

UNIT II   ELECTRICAL   MACHINES   12

Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single Phase Transformer, Single Phase Induction Motor.

UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS   12

Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation. Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics – Elementary Treatment of Small Signal Amplifier

UNIT IV DIGITAL ELECTRONICS   12

Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops – Registers and Counters – A/D and D/A Conversion (simple concepts)

UNIT V   FUNDAMENTALS OF COMMUNICATION ENGINEERING   12

Types of Signals: Analog and Digital Signals – Modulation and Demodulation: Principles of Amplitude and Frequency Modulations. Communication Systems: Radio, TV, Fax, Microwave, Satellite and Optical Fibre (Block Diagram Approach only).

TOTAL: 60 PERIODS

TEXT BOOKS
1. R.S. Sedha, "Applied Electronics" S. Chand & Co., 2006.
2. V.N. Mittle "Basic Electrical Engineering", Tata McGraw Hill Edition, New Delhi, 1990.

REFERENCES
1. Gnanavadivel,C. Senthilkumar, A. Vijaykumar, S. Joseph Gladwin, "Basic Electrical and Electronics Engineering", Anuradha Publishers (2011).
2. Muthusubramanian.R, Salivahanan.S and Muraleedharan.K.A, "Basic Electrical, Electronics and Computer Engineering", Tata McGraw Hill, Second Edition (2006).
3. Nagsarkar T K and Sukhija M S, "Basics of Electrical Engineering", Oxford press (2005).
4. Premkumar N, "Basic Electrical Engineering", Anuradha Publishers (2003).
5. Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum Outline Series, McGraw Hill (2002).
6. Mehta V K, "Principles of Electronics", S.Chand & Company Ltd., (1994).

(b)   BME202 BASIC CIVIL & MECHANICAL ENGINEERING   L T P C
(For CSE, ECE, EEE, EIE & IT branches)   4 0 0 4

A – CIVIL ENGINEERING

UNIT I SURVEYING AND CIVIL ENGINEERING MATERIALS   15
Surveying: Objects – types – classification – principles – measurements of distances – angles – leveling – determination of areas – illustrative examples.
Civil Engineering Materials: Bricks – stones – sand – cement – concrete – steel sections.

UNIT II   BUILDING COMPONENTS AND STRUCTURES   15
Foundations: Types – Bearing capacity – Requirement of good foundations.
Superstructure: Brick masonry – stone masonry – Beams –Columns – Lintels – Roofing – Flooring – Plastering – Mechanics – Internal and external forces – stress – strain – elasticity – Types of Bridges and Dams – Basics of Interior Design and Landscaping.

TOTAL: 30 PERIODS

B – MECHANICAL ENGINEERING

UNIT III   POWER PLANT ENGINEERING   10
Introduction, Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydro-electric and Nuclear Power plants – Merits and Demerits – Pumps and turbines – working principle of Reciprocating pumps (single acting and double acting) – Centrifugal Pump.

UNIT IV   IC ENGINES   10
Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Boiler as a power plant.

UNIT V   REFRIGERATION AND AIR CONDITIONING SYSTEM   10
Terminology of Refrigeration and Air Conditioning: Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.

TOTAL: 30 PERIODS

REFERENCES
1. Shanmugam.G and Palanichamy.M.S, "Basic Civil and Mechanical Engineering", Tata McGraw Hill Publishing Co., New Delhi (1996).
2. Ramamrutham. S, "Basic Civil Engineering", Dhanpat Rai Publishing Co. (P) Ltd. 1999.
3. Seetharaman S. "Basic Civil Engineering", Anuradha Agencies (2005).
4. Venugopal K and Prahu Raja V, "Basic Mechanical Engineering", Anuradha Publishers, Kumbakonam (2000).
5. Shantha Kumar S R J., "Basic Mechanical Engineering", Hi-tech Publications, Mayiladuthurai (2000).

BCS231   **COMPUTER PRACTICE LABORATORY – II**   **L T P C**
                              (*Common to all branches*)   **0 1 2 2**

LIST OF EXPERIMENTS

1. UNIX COMMANDS

Study of Unix OS – Basic Shell Commands – Vi Editor.

2. SHELL PROGRAMMING

Simple Shell program – Conditional Statements – Testing and Loops.

3. C PROGRAMMING ON UNIX

Dynamic Storage Allocation – Pointers – Functions – File Handling.

TOTAL: 45 PERIODS

HARDWARE / SOFTWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS

Hardware

- UNIX Clone Server – 1 No
- Nodes (thin client or PCs) – 33 Nos
- Printer – 3 Nos.

Software

- OS – UNIX Clone (33 user license or License free Linux)
- Compiler - C

BPC231   PHYSICS AND CHEMISTRY LABORATORY – II   L T P C
                         (*Common to all branches*)   **0   0   3 2**

PHYSICS LABORATORY – II
LIST OF EXPERIMENTS
1. Determination of Young's modulus of the material – non uniform bending.
2. Determination of Band Gap of a semiconductor material.
3. Determination of specific resistance of a given coil of wire – Carey Foster Bridge.
4. Determination of viscosity of liquid – Poiseuille's method.
5. Spectrometer dispersive power of a prism.
6. Determination of Young's modulus of the material – uniform bending.
7. Torsional pendulum – Determination of rigidity modulus.

• **A minimum of FIVE experiments shall be offered.**
• **Laboratory classes on alternate weeks for Physics and Chemistry.**

CHEMISTRY LABORATORY – II

LIST OF EXPERIMENTS
1. Conductometric titration (Simple acid base)
2. Conductometric titration (Mixture of weak and strong acids)
3. Conductometric titration using $BaCl_2$ Vs Na_2SO_4
4. Potentiometric Titration (Fe^{2+} Vs $K_2Cr_2O_7$)
5. pH Titration (Acid & Base)
6. Determination of water of crystallization of a crystalline salt ($CuSO_4$)
7. Estimation of Ferric ion by spectrophotometry.

• **A minimum of FIVE experiments shall be offered.**
• **Laboratory classes on alternate weeks for Physics and Chemistry.**

(a) BME231 COMPUTER AIDED DRAFTING AND MODELING LABORATORY   L   T   P   C
(For Mechanical & Civil Branches)   0   1   2   2

List of Exercises using software capable of Drafting and Modeling

1. Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.
2. Drawing of a Title Block with necessary text and projection symbol.
3. Drawing of curves like parabola, spiral, involute using Bspline or cubic spline.
4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning.
5. Drawing front view, top view and side view of objects from the given pictorial views (eg. V-block, Base of a mixie, Simple stool, Objects with hole and curves).
6. Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.)
7. Drawing of a simple steel truss.
8. Drawing sectional views of prism, pyramid, cylinder, cone, etc,
9. Drawing isometric projection of simple objects.
10. Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-D model.

Note : **Plotting of drawings must be made for each exercise and attached to the records written by students.**

List of Equipments for a batch of 30 students:

1. Pentium IV computer or better hardware, with suitable graphics facility – 30 Nos.
2. Licensed software for Drafting and Modeling – 30 Licenses
3. Laser Printer or Plotter to print / plot drawings – 2 Nos.

(b)   BEE231   ELECTRICAL CIRCUITS LABORATORY   **L T P C**
(For EEE & EIE branches)   **0   0   3   2**

LIST OF EXPERIMENTS
- Verification of ohm's laws and kirchoff's laws.
- Verification of Thevenin's and Norton's Theorem
- Verification of superposition Theorem
- Verification of maximum power transfer theorem.
- Verification of reciprocity theorem
- Measurement of self inductance of a coil
- Verification of mesh and nodal analysis.
- Transient response of RL and RC circuits for DC input.
- Frequency response of series and parallel resonance circuits.
- Frequency response of single tuned circuits.

TOTAL: 45 PERIODS

(c)   **BEC231 CIRCUITS AND DEVICES LABORATORY**   **L T P C**
                  (For ECE, CSE & IT branches)   **0 0 3 2**

- Verification of KVL and KCL
- Verification of Thevenin and Norton Theorems.
- Verification of superposition Theorem.
- Verification of Maximum power transfer and reciprocity theorems.
- Frequency response of series and parallel resonance circuits.
- Characteristics of PN and Zener diode
- Characteristics of CE configuration
- Characteristics of CB configuration
- Characteristics of UJT and SCR
- Characteristics of JFET and MOSFET
- Characteristics of Diac and Triac.
- Characteristics of Photodiode and Phototransistor.

TOTAL: 45 PERIODS

BEG231   ENGLISH LANGUAGE SKILL LABORATORY (Skill of Listening) L T P C
(*Common to all branches*)   **0 0 3 2**

UNIT I (Micro Skills I)   4
Tasks (Type I): Lexical word identification
  A. Identifying the homophones/words with silent letters/often mispronounced words
  B. Identifying the missing words in native speech (Native accent)

Tasks (Type II): Decompressing structures
  A. Expanding sound units into word clusters (Ex: verbs with multiple auxiliaries/contracted forms)
  B. Identifying the constituent words in collocations/compound words/idiomatic phrases

UNIT II (Micro Skills II): Identifying tonal variations for meaning making   6
Tasks:
  A. Punctuating the script after listening to it.
  B. Marking word chunks/tone groups in transcript after listening to it.
  C. Marking syllable stress in words.
  D. Identifying tonal variations expressing rhetorical questions/ information seeking Questions / Exclamations / General statements.

UNIT III Content Comprehension and Making Inferences   12
Tasks:
  A. Listening and filling in the chart
  B. Multiple choice questions (Negative/factual)
  C. True/False questions
  D. Questions with multiple answers (choosing two/three correct answers)
  E. Matching information
  F. Filling the blanks (not more than three words)
  G. Comprehending the text organization

UNIT IV Listening and act   8
Tasks:
  A. Locating spots in a map following the given directions
  B. Transferring data to graphs/diagrams/flow charts
  C. Diagram/Picture completing tasks
  D. Finding the answer through the process of elimination

TOTAL: 30 PERIODS

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Curriculum & Syllabus for B.E. (EIE)   Regulations-2011

BMA301   TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS   L T P C
(Common to all branches)   3 1 0 4

OBJECTIVES

The course objective is to develop the skills of the students in the areas of Transforms and Partial Differential Equations. This will be necessary for their effective studies in a large number of engineering subjects like heat conduction, communication systems, electro-optics and electromagnetic theory. The course will also serve as a prerequisite for post graduate and specialized studies and research.

UNIT I   FOURIER SERIES   (9L+3T)

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier series – Parseval's identity – Harmonic analysis.

UNIT II   FOURIER TRANSFORMS   (9L+3T)

Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT III   PARTIAL DIFFERENTIAL EQUATIONS   (9L+3T)

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

UNIT IV   APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS   (9L+3T)

Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two-dimensional equation of heat conduction (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates.

UNIT V   Z - TRANSFORMS AND DIFFERENCE EQUATIONS   (9L+3T)

Z-transforms - Elementary properties – Inverse Z-transform – Convolution theorem - Formation of difference equations – Solution of difference equations using Z-transform.

Lectures: 45   Tutorials: 15   Total: 60 Periods

TEXT BOOK

1. Grewal, B.S, "*Higher Engineering Mathematics*", 40th Edition, Khanna publishers, Delhi, (2007)

REFERENCES

1. Bali.N.P and Manish Goyal, "*A Textbook of Engineering Mathematics*", 7th Edition, Laxmi Publications(P) Ltd. (2007)
2. Ramana.B.V., "*Higher Engineering Mathematics*", Tata Mc-GrawHill Publishing Company limited, New Delhi (2007).
3. Glyn James, "*Advanced Modern Engineering Mathematics*", 3rd Edition, Pearson Education (2007).
4. Erwin Kreyszig, "*Advanced Engineering Mathematics*", 8th edition, Wiley India (2007).

BCE301   ENVIRONMENTAL SCIENCE AND ENGINEERING   L T P C
(Common to 3rd Sem – Civil, CSE, IT, EEE and EIE   **3 0 0 3**
5th Sem – Mechanical, 7th Sem - ECE)

AIM

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

OBJECTIVE

At the end of this course the student is expected to understand what constitutes the environment, what are precious resources in the environment, how to conserve these resources, what is the role of a human being in maintaining a clean environment and useful environment for the future generations and how to maintain ecological balance and preserve bio-diversity. The role of government and non-government organization in environment managements.

UNIT I   ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY   14

Definition, scope and importance of environment – need for public awareness – concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) –Introduction to biodiversity definition: 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, man-wildlife conflicts –endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds - Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II   ENVIRONMENTAL POLLUTION   8

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – soil waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III   NATURAL RESOURCES   10

Forest resources: Use and over-exploitation, deforestation, case studies – timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over – utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer – pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy

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sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV   SOCIAL ISSUES AND THE ENVIRONMENT   7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of nongovernmental organization – environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation – central and state pollution control boards- Public awareness.

UNIT V   HUMAN POPULATION AND THE ENVIRONMENT   6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV /AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TOTAL: 45

TEXT BOOKS
1. Gilbert M.Masters, "Introduction to Environmental Engineering and Science", 2nd Edition, Pearson Education, 2008.
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2006.

REFERENCES
1. R.K. Trivedi, "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media, BS Publications, 2004.
2. Cunningham, W.P. Cooper, T.H. Gorhani, "Environmental Encyclopedia", Jaico Publishing House, Mumbai, 2001.
3. Dharmendra S. Sengar, "Environmental law", Prentice Hall of India (P) Ltd., New Delhi, 2007.
4. Rajagopalan R, "Environmental Studies-From Crisis to Cure", Oxford University Press, 2005.

BEE305   ELECTRICAL MACHINES   L T P C
                                                          3 0 0 3

AIM

 To impart basic knowledge on Electrical machines, principles and its behavior.

OBJECTIVES

 At the end of this course, student would have been exposed to:

- Theory of structures, operating principle, characteristics, and applications of D.C and A.C rotating machines and transformers in detail.
- Introductory knowledge on Special Machines.

UNIT I   D.C. MACHINES   12

Construction of D.C. Machines - Principle and theory of operation of D.C. generator - EMF equation - Characteristics of D.C. generators - Armature reaction – Commutation - Principle of operation of D.C. motor - Voltage equation - Torque equation - Types of D.C. motors and their characteristics –Starters - Speed control of D.C. motors - Applications.

UNIT II   TRANSFORMERS   9

Principle - Theory of ideal transformer - EMF equation - Construction details of shell and core type transformers - Tests on transformers - Equivalent circuit - Phasor diagram - Regulation and efficiency of a transformer - Introduction to three - phase transformer connections.

UNIT III   SYNCHRONOUS MACHINES   8

Principle of alternators:- Construction details, Equation of induced EMF and Vector diagram - Synchronous motor:- Starting methods, Torque, V curves, Speed control and Hunting.

UNIT IV   INDUCTION MACHINES   9

Induction motor:- Construction and principle of operation, Classification of induction motor, Torque equation, Condition for maximum torque, Equivalent Circuit, Starting methods and Speed control of induction motors.

UNIT V   SPECIAL MACHINES   7

Types of single phase motor –Double revolving field theory – Cross field theory – Capacitor start capacitor run motors – Shaded pole motor – Repulsion type motor – Universal motor – Hysteresis motor - Permanent magnet synchronous motor – Switched reluctance motor – Brushless D.C motor.

L = 45 TOTAL = 45

TEXT BOOKS

1. Nagrath.I.J., and Kothari.D.P., " Electrical Machines", Tata McGraw - Hill, 3rd Edition, 2004.
2. Fitzgerald A.E, Kingsley C., Umans, S. and Umans S.D., "Electric Machinery", McGraw-Hill, Singapore, 2000.

REFERENCES

1. Theraja, B.L., "A Text book of Electrical Technology", Vol.II, S.C Chand and Co., New Delhi, 2007.
2. Del Toro, V., "Electrical Engineering Fundamentals", Prentice Hall of India, New Delhi, 1995.
3. Cotton, H., "Advanced Electrical Technology", Sir Isaac Pitman and Sons Limited, London, 1999.

BEI301   ELECTRICAL MEASUREMENTS   **L T P C**
                                                                                                            4 0 0 4

AIM

      To provide adequate knowledge in electrical measurements and instrumentation

OBJECTIVES

- To make the students to gain a clear knowledge of the basic laws governing the operation of electrical instruments and the measurement techniques
- Emphasis is laid on the meters used to measure current & voltage.
- To have an adequate knowledge in the measurement techniques for power and energy, power and energy meters are included.
- Elaborate discussion about potentiometer & instrument transformers.
- Detailed study of resistance measuring methods.
- Detailed study of inductance and capacitance measurement.

UNIT I   MEASUREMENT OF VOLTAGE AND CURRENT   9

Galvanometers – Ballistic, D'Arsonval galvanometer – Theory, calibration, application – Principle, construction, operation and comparison of moving coil, moving iron meters, dynamometer, induction type & thermal type meter, rectifier type – Extension of range and calibration of voltmeter and ammeter – Errors and compensation.

UNIT II   MEASUREMENT OF POWER AND ENERGY   9

Electrodynamometer type wattmeter – Theory & its errors – Methods of correction – LPF wattmeter – Phantom loading – Induction type kWh meter – Induction type energy meter – Calibration of wattmeter.

UNIT III   POTENTIOMETERS & INSTRUMENT TRANSFORMERS   9

DC potentiometer – Basic circuit, standardization – Laboratory type (Crompton's) – AC potentiometer – Drysdale (polar type) type – Gall-Tinsley (coordinate) type – Limitations & applications – C.T and P.T construction, theory, operation and characteristics.

UNIT IV   RESISTANCE MEASUREMENT   9

Measurement of low, medium & high resistance – Ammeter, voltmeter method – Wheatstone bridge – Kelvin double bridge – Series and shunt type ohmmeter – High resistance measurement – Megger – Direct deflection methods – Price's guard-wire method – Earth resistance measurement.

UNIT V   IMPEDANCE MEASUREMENT   9

A.C bridges – Measurement of inductance, capacitance – Q of coil – Maxwell Bridge – Wein's bridge – Schering bridge – Anderson bridge – Campbell bridge to measure mutual inductance – Errors in A.C. bridge methods and their compensation – Detectors – Excited field – A.C. galvanometer – Vibration galvanometer.

                                                                L = 45 T = 15 Total = 60

TEXT BOOKS

1. A.K. Sawhney, 'A Course in Electrical & Electronic Measurements and Instrumentation', Dhanpath Rai & Co (P) Ltd, 2013.
2. E.W. Golding & F.C.Widdis, 'Electrical Measurements & Measuring Instruments', A.H.Wheeler & Co, 2001

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REFERENCES

1. J.B.Gupta, 'A Course in Electronic and Electrical Measurements and Instrumentation', S.K. Kataria & Sons, Delhi, 2003.
2. S.K.Singh, 'Industrial Instrumentation and Control', Tata McGraw Hill, 2nd Edition, 2002.
3. H.S.Kalsi, 'Electronic Instrumentation', Tata McGraw Hill, 2004.
4. Martin U. Reissland, 'Electrical Measurement – Fundamental Concepts and Applications', New Age International (P) Ltd., 2001.

BEI302   ELECTRONIC DEVICES AND CIRCUITS   L T P C
3 0 0 3

AIM

> To provide an exposure to various electronic devices and electronic circuits.

OBJECTIVE

- At the end of the course, students' will have the knowledge about functioning of various types of devices and design of various electronic circuits.

UNIT I   SEMICONDUCTOR DIODE AND BJT   9

PN Junction – Current components in a PN diode – Junction capacitance – Junction diode switching time – Zener diode – Varactor diode – Tunnel diode – Schottky diode – Transistor Structure – Basic Transistor operation – Transistor characteristics and parameters – The transistor as a switch, as an amplifier – Transistor bias circuits:- Voltage divider bias circuits, base bias circuits, emitter bias circuits, collector feedback bias circuits – DC load line – AC load line- bias stabilization, thermal runaway and thermal stability.

UNIT II   FET, UJT and SCR   9

JFET characteristics and parameters – JFET biasing, self bias, voltage divider bias – Q point, stability over temperature – MOSFET, D-MOSFET, E-MOSFET – MOSFET characteristics and parameters – MOSFET biasing, zero bias, voltage divider bias method, drain feedback bias – Characteristics and applications of UJT, SCR, DIAC, TRIAC.

UNIT III   AMPLIFIERS   9

CE, CC and CB amplifiers - Small signal low frequency transistor amplifier circuits – h parameter representation of a transistor - Analysis of single stage transistor amplifier using parameters voltage gain, current gain, input impedance and output impedance frequency response - RC coupled amplifier. Classification of Power amplifiers:- Class A, B, AB and C Power amplifiers - Push-Pull and Complementary Symmetry Push-Pull amplifiers - Design of power output, efficiency and cross-over distortion.

UNIT IV   FEEDBACK AMPLIFIERS AND OSCILLATORS   9

Advantages of Negative feedback - Voltage/current, series/shunt feedback-Positive feedback - Condition for oscillators - Phase shift - Wein Bridge – Hartley - Colpitts and crystal oscillators.

UNIT V   PULSE CIRCUITS AND POWER SUPPLIES   9

RC wave shaping circuits - Diode clampers and clippers – Multivibrators –Schmitt triggers - UJT - Saw tooth oscillators - Single and polyphase rectifiers and analysis of filter circuits - Design of zener and transistor series voltage regulators - Switched mode power supplies.

L = 45 TOTAL = 45

TEXT BOOKS

1. Millman and Halkias, "Electronic Devices and Circuits", Tata McGraw– Hill, 2007.
2. Floyd, T.L, "Electronic Devices" 6th Edition, Pearson Education, 2003.
3. Millman and Halkias, "Integrated Electronics", McGraw-Hill, 2004.

REFERENCES

1. Mottershead.A, "Electronic Devices & Circuits an Introduction", Prentice Hall of India, 2003.
2. Boylsted and Nashelsky, "Electronic Devices and Circuit Theory", Prentice Hall of India, 6th Edition, 2009.
3. Streetman, B. and Sanjay, B., "Solid State Electronic Devices", Prentice Hall of India, 5th Edition, 2005.
4. Bell, D.A., "Electronic Devices and Circuits", Prentice Hall of India, 4th Edition, 1999.
5. Millman, J., Prakash Rao., M.S. and Taub, H., "Pulse Digital and Switching Wave Forms", McGraw-Hill, 2007.

BCS304 **DATA STRUCTURES AND ALGORITHMS** **L T P C**
(Common to EEE & EIE) **3 0 0 3**

AIM

- To master the design and applications of linear, tree, and graph structures. To understand various algorithm design and analysis techniques.

UNIT I **LINEAR STRUCTURES** **9**

Abstract Data Types (ADT) – List ADT – array-based implementation – linked list implementation – cursor-based linked lists – doubly-linked lists – applications of lists – Stack ADT – Queue ADT – circular queue implementation – Applications of stacks and queues

UNIT II **TREE STRUCTURES** **9**

Need for non-linear structures – Tree ADT – tree traversals – left child right sibling data structures for general trees – Binary Tree ADT – expression trees – applications of trees – binary search tree ADT

UNIT III **BALANCED SEARCH TREES AND INDEXING** **9**

AVL trees – Binary Heaps – B-Tree – Hashing – Separate chaining – open addressing – Linear probing

UNIT IV **GRAPHS** **9**

Definitions – Topological sort – breadth-first traversal - shortest-path algorithms – minimum spanning tree – Prim's and Kruskal's algorithms – Depth-first traversal – biconnectivity – euler circuits – applications of graphs.

UNIT V **ALGORITHM DESIGN AND ANALYSIS** **9**

Greedy algorithms – Divide and conquer – Dynamic programming – backtracking – branch and bound – Randomized algorithms – algorithm analysis – asymptotic notations – recurrences – NP-complete problems

L = 45 Total = 45

TEXT BOOKS
1. M. A. Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education Asia, 2011.
2. ISRD Group, "Data Structures using C", Tata McGraw-Hill Publishing Company Ltd., 2006.

REFERENCES
1. R. F. Gilberg, B. A. Forouzan, "Data Structures: A Pseudocode approach with C", 2nd Edition, Thomson India Edition, 2005.
2. Sara Baase and A. Van Gelder, "Computer Algorithms", 3rd Edition, Pearson Education, 2000.
3. T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, "Introduction to algorithms", 2nd Edition, Prentice Hall of India Ltd, 2008.

BEI331   ELECTRONIC DEVICES AND CIRCUITS LABORATORY   L T P C

0 0 3 2

1. Characteristics of Semiconductor diode and Zener diode

2. Characteristics of Transistor in Common Emitter, Common Collector, and Common Base Configuration

3. Characteristics of FET

4. Characteristics of UJT

5. Characteristics of SCR, DIAC and TRIAC

6. Photo diode, phototransistor Characteristics and study of light activated relay circuit

7. Static Characteristics of Thermistors

8. Single phase half wave and full wave rectifiers with inductive and capacitive filters

9. Differential amplifier using FET

10. Study of CRO

11. Series and Parallel resonance circuits

12. Realization of Passive filters

P = 45 TOTAL = 45

BEE334   **ELECTRICAL MACHINES LABORATORY**   **L T P C**
0 0 3 2

1.   Open circuit characteristic of DC Shunt Generator

2.   Load test on DC Shunt Generator

3.   Speed control of DC Shunt Motor

4.   Brake test on DC Shunt Motor

5.   Brake test on DC Series Motor

6.   Regulation characteristic of three - phase Alternator

7.   Open circuit and short circuit tests on Single - phase Transformer

8.   Load test on Single - phase Transformer

9.   Load test on Three - phase Induction Motor

10. Brake test on Single - phase Induction Motor

11. 'V' curves of Synchronous Motor

12. Power measurement in three - phase circuit using two – wattmeter method

P = 45 TOTAL = 45

BCS334   DATA STRUCTURES AND ALGORITHMS LABORATORY   L T P C
(Common to EEE & EIE)   **0 0 3 2**

Aim

To develop skills in design and implementation of data structures and their applications.

1.   Implement singly and doubly linked lists.

2.   Represent a polynomial as a linked list and write functions for polynomial addition.

3.   Implement stack and use it to convert infix to postfix expression

4.   Implement array-based circular queue and use it to simulate a producer consumer problem.

5.   Implement an expression tree. Produce its pre-order, in-order, and post-order traversals.

6.   Implement binary search tree.

7.   Implement insertion in AVL trees.

8.   Implement priority queue using heaps

9.   Implement hashing techniques

10. Perform topological sort on a directed graph to decide if it is acyclic.

11. Implement Dijkstra's algorithm using priority queues

12. Implement Prim's and Kruskal's algorithms

13. Implement a backtracking algorithm for Knapsack problem

14. Implement a branch and bound algorithm for traveling salesperson problem

15. Implement any randomized algorithm.

P = 45 Total = 45

BEG331   COMMUNICATION SKILLS AND TECHNICAL SEMINAR – I   L T P C
(Common to all branches)   0 0 3 2
(To be conducted as a Practical Paper by the Depts of English for 3 hrs per week)

OBJECTIVES:
- To improve the learners' oral fluency in English
- To help the learners acquire the readiness to speak in English
- To develop the sub-skills required for paper presentations and group discussions
- To help the learners improve their vocabulary related to specific fields of technology
- To facilitate the development of the learners' proficiency in meaningful interaction
- To provide them linguistic support for managing vital sub-functions of communication

COURSE CONTENT:

A) Phonetic practice (7 hrs)
1. English phonemes with special emphasis on the diphthongs
2. Stress patterns for words that end with specific suffixes.
    (*'ion' , 'ic' 'ical' 'ious','ate' , 'ise/-ize', 'fy', 'logy', 'ity'*)

B) Speech practice (8 hrs)

  Speaking on the themes by developing the hints provided.
  The themes are:
1. Cloning
2. Artificial satellites
3. Renewable sources
4. Telecommunication
5. Cyber Revolution
6. Space research
7. Polythene pollution
8. Fossil fuels
9. Climate change
10. Ecological threats
11. Water resources
12. Nuclear technology
13. Scientific farming
14. Thermal power plants
15. Natural calamities
16. Robotics
17. Artificial intelligence
18. Role of Fibre Optics
19. Exploration of Mars
20. Gas turbines

C) Group Quiz on technical aspects related to the themes (4hrs)

D) Language Functions (8 hrs)
1. comparing and contrast
2. reporting the conversation of others
3. talking about future plans and intentions
4. giving reasons
5. expressing preferences
6. quantifying
7. expressing certainty and uncertainty
8. expressing opinions and impressions
9. making suggestions

10. expressing assumptions
11. evaluating options
12. hypothesing/deducing
13. defending a point of view

E) Seminar presentation on the themes allotted (18 hrs)
PROCEDURE:
A) Phonetic practice
All the speech sounds should be taught .The learners should be given drills in the pronunciation of at least 30 words for each sound. While practicing stress patterns, they should be encouraged to identify as many words as possible for each suffix endings.

B) Speech practice
Every student should be allowed to choose one theme to specialize in. (However not more than 4 students in a section can choose the same theme).The teacher has to prepare at least 4 hints development tasks on each theme and should provide chance to each learner to speak on those hints related to his/ her theme (5 minutes).The hints may be supplied to the students in advance. When a student speaks, the class should be encouraged to ask questions as well as note down the words related to the different fields.

C) Group Quiz on technical phrases related to the themes.
The class should be divided into groups that specialize on a particular theme. Each group should conduct a quiz (question & answer session) which will be answered by the other groups.

D) Language Functions
The teacher should build micro activities to develop the use of language required to handle these sub-functions of communication. In the process, the learners should get used to the linguistic elements needed for these functions.

E) Seminar presentation on the themes allotted
Each student should collect materials from books, journals and newspapers for his/her theme and prepare a short seminar paper. The presentation should be for 10 minutes. It should be followed 'open house' during which others should come forward to question, clarify, supplement or evaluate.

RECORD LAY OUT:
   Every student has to maintain a record in which he/she has to incorporate the following details.
   - First page containing learner details and the topic of specialization.
   - Twenty words for each phoneme
   - Twenty words with stress marks for each suffix ending
   - Vocabulary list (technical words and compound words) related to the 20 themes identified for this semester.
   - Three news paper items, two journal items and three internet sources related to the special theme selected by the student.(To be pasted on the pages)
   - The Quiz questions of the group with expected answers.
   - The seminar paper presented by the learner with details about the open house.
   - Notes of observation. (Details about any three seminar paper presentations by others)
   - The record should be duly signed by the course teacher and submitted to the External Examiner for verification during the semester practicals.

P = 45 Total = 45

BEI401   INDUSTRIAL INSTRUMENTATION - I   L T P C
                                                                                                     3 0 0 3

AIM

To equip the students with relevant knowledge to suit the industrial requirements

OBJECTIVES
- To provide sound knowledge about various techniques used for the measurement of industrial parameters.
- Discussion of load cells, torque meter and various velocity pick-ups.
- Exposure to various accelerometer pick-ups, vibrometers, density and viscosity pick-ups.
- To have an adequate knowledge about pressure transducers.
- To have an idea about the temperature standards, calibration and signal conditioning used in RTD's.
- To have a sound knowledge about thermocouples and pyrometry techniques.

UNIT I   MEASUREMENT OF FORCE, TORQUE AND VELOCITY   9
Electric balance – Different types of load cells – Hydraulic, pneumatic strain gauge- Magneto elastic and Piezo electric load cell – Different methods of torque measurements: strain gauge-Relative angular twist-Speed measurement:-Capacitive tacho-Dragcup type tacho-D.C and A.C tachogenerators – Stroboscope.

UNIT II   MEASUREMENT OF ACCELERATION, VIBRATION AND DENSITY   9
Accelerometers:- LVDT, Piezo-electric, Strain gauge and Variable reluctance type accelerometer – Mechanical type vibration instruments – Seismic instruments as an accelerometer – Vibrometers : Calibration of vibration pickups – Units of density and specific gravity – Baume scale, and API scale-Pressure head type densitometers- Float type densitometers – Ultrasonic densitometer- Bridge type gas densitometer.

UNIT III   PRESSURE MEASUREMENT   9
Units of pressure-Manometers-Different types –Elastic type pressure gauges: Bourdon tube, bellows and diaphragms-Electrical methods: Elastic elements with LVDT and strain gauges –Capacitive type pressure gauge –Piezo-resistive pressure sensor-Resonator pressure sensor-Measurement of vacuum:-McLeod gauge-Thermal conductivity gauges- Ionization gauges:– Cold cathode type and hot cathode type-Testing and calibration of pressure gauges-Dead weight tester.

UNIT IV   TEMPERATURE MEASUREMENT   9
Definitions and standards-Primary and secondary fixed points –Calibration of thermometers - Different types of filled in system thermometer-Sources of errors in filled in systems and their compensation-Bimetallic thermometers – Electrical methods of temperature measurement-Signal conditioning of industrial RTDs and their characteristics-3 lead and 4 lead RTDs - Thermistors.

UNIT V   THERMOCOUPLES AND RADIATION PYROMETERS   9
Thermocouples-Laws of thermocouple –Fabrication of industrial thermocouples –Signal conditioning of thermocouple output-Isothermal block reference junctions – Commercial circuits for cold junction compensation-Response of thermocouple –Special techniques for measuring high temperature using thermocouples – Radiation fundamentals Radiation methods of temperature measurement –- Total radiation pyrometers-Optical pyrometers-Two colour radiation pyrometers – Fiber optic temperature measurement.

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L = 45 Total = 45

TEXT BOOKS

1. Doebelin, E.O, "Measurement systems Application and Design", International Student Edition, 5th Edition, McGraw Hill Book Company,2004.
2. Jone's Instrument Technology, Vol.2, Butterworth-Heinemann, International Edition, 2003.
3. A.K. Sawhney, 'A course in Electrical & Electronic Measurements and Instrumentation', Dhanpath Rai & Co (P) Ltd, 2005.

REFERENCES

1. Liptak, B.G., "Instrumentation Engineers Handbook (Measurement)", CRC Press, 2005
2. Patranabis.D., "Principles of Industrial Instrumentation", 2nd Edition, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1999.
3. Holman,P., "Experimental methods for Engineers", 6th Edition, McGraw Hill Book Company, 2000.
4. Nakra, B.C., and Chaudry, K.K., "Instrumentation measurement and Analysis", TataMcGraw Hill publishing Company Limited, 2004.

BEI402   **TRANSDUCER ENGINEERING**   **L T P C**
                                                                            3 0 0 3

AIM
> To provide adequate knowledge in sensors and transducers

OBJECTIVES
- To impart knowledge about the principles and analysis of sensors.
- Discussion of errors and error analysis.
- Emphasis on characteristics and response of transducers.
- To have an adequate knowledge in resistance transducers.
- Basic knowledge in inductance and capacitance transducers and exposure to other transducers.

UNIT I   SCIENCE OF MEASUREMENTS AND INSTRUMENTATION OF
**   TRANSDUCERS   9**
Units and standards – Calibration methods – Static calibration – Classification of errors – Error analysis – Statistical methods – Odds and uncertainty – Classification of transducers – Selection of transducers.

UNIT II   CHARACTERISTICS OF TRANSDUCERS   9
Static characteristics – Accuracy, precision, resolution, sensitivity, linearity –Dynamic characteristics – Mathematical model of transducer – Zero, I and II order transducers. Response to impulse, step, ramp and sinusoidal inputs.

UNIT III   VARIABLE RESISTANCE TRANSDUCERS   9
Principle of operation, construction details, characteristics and application of potentiometer, strain gauge, resistance thermometer, Thermistor, hot-wire anemometer, piezoresistive sensor and humidity sensor.

UNIT IV VARIABLE INDUCTANCE AND VARIABLE CAPACITANCE TRANSDUCERS 9
Induction potentiometer – Variable reluctance transducers – EI pick up – Principle of operation, construction details, characteristics and application of LVDT –Capacitive transducer and types – Capacitor microphone – Frequency response.

UNIT V   OTHER TRANSDUCERS   9
Piezoelectric transducer, Hall Effect transducer – Different types of Photo detectors- Digital transducers – Smart sensors - Fibre optic sensors, SQUID sensors, Film sensors, MEMS – Nano sensors.

L = 45 Total = 45

TEXT BOOKS
1. E.O. Doebelin, 'Measurement Systems – Applications and Design', Tata McGraw Hill, New York, 2004.
2. A.K. Sawhney, 'A course in Electrical & Electronic Measurement and Instrumentation', Dhanpat Rai and Co (P) Ltd., 2005.

REFERENCES
1. D. Patranabis, 'Sensors and Transducers', Prentice Hall of India, 2001.
2. John P. Bentley, 'Principles of Measurement Systems', III Edition, Pearson Education, 2000.

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Curriculum & Syllabus for B.E. (EIE)   Regulations-2011

BEI403   **DIGITAL CIRCUITS**   **L T P C**
                                                                                          3 1 0 4

AIM

To introduce the fundamentals of digital circuits, combinational and sequential circuit

OBJECTIVES
- To study various number systems and to simplify the mathematical expressions using Boolean functions – simple problems.
- To study implementation of combinational circuits
- To study the design of various synchronous and asynchronous circuits.
- To expose the students to various memory devices.

UNIT I   NUMBER SYSTEMS AND BOOLEAN ALGEBRA   12

Review of number systems: types and conversion, codes. Boolean algebra: De-Morgan's theorem, switching functions and simplification using K-maps and Quine McCluskey method.

UNIT II   COMBINATIONAL CIRCUITS   12

Design of Logic gates. Design of adder, subtractor, comparators, code converters, encoders, decoders, multiplexers and demultiplexers. Function realization using gates and multiplexers.

UNIT III   SYNCHRONOUS SEQUENTIAL CIRCUITS   12

Flip flops - SR, D, JK and T. Analysis of synchronous sequential circuits: design of synchronous, sequential circuits – Completely and incompletely specified sequential circuits - state diagram; state reduction, state assignment Counters – synchronous, a synchronous, updown and Johnson counters, shift registers.

UNIT IV   ASYNCHRONOUS SEQUENCTIAL CIRCUITS   12

Analysis of asynchronous sequential machines, state assignment, asynchronous design problem.

**UNIT V   MEMORY DEVICES, PROGRAMMABLE LOGIC DEVICES AND LOGIC
                   FAMILIES   12**

Memories: ROM, PROM, EPROM, PLA, PLD, FPGA, Digital logic families: TTL, ECL, CMOS.

L = 45 T = 15 Total = 60

TEXT BOOKS
1. M. Morris Mano, 'Digital Logic and Computer Design', Prentice Hall of India, 10th Edition 2008.
2. John M.Yarbrough, 'Digital Logic, Application & Design', Thomson, 2002.

REFERENCES
1. Charles H.Roth, 'Fundamentals Logic Design', Jaico Publishing, 6th Edition, 2009.
2. Floyd, 'Digital Fundamentals', 8th Edition, Pearson Education, 2005.
3. John F.Wakerly, 'Digital Design Principles and Practice', 3rd Edition, Pearson Education, 2002.

BEE402   **CONTROL SYSTEMS**   **L T P C**
                (Common to EEE & EIE)   **3 1 0 4**

AIM

To provide sound knowledge in the basic concepts of linear control theory and design of control system.

OBJECTIVES

- To understand the methods of representation of systems and to desire their transfer function models.
- To provide adequate knowledge in the time response of systems and steady state error analysis.
- To accord basic knowledge in obtaining the open loop and closed–loop frequency responses of the system.
- To understand the concept of stability of control system and methods of stability analysis.
- To study the three ways of designing compensation for a control system.

UNIT I   SYSTEMS AND THEIR REPRESENTATION   9

Basic elements in control systems – Open and closed loop systems – Electrical analogy of mechanical and thermal systems – Transfer function – Synchros – AC and DC servomotors – Block diagram reduction techniques – Signal flow graphs.

UNIT II   TIME RESPONSE   9

Time response – Time domain specifications – Types of test input – I and II order system response – Error coefficients – Generalized error series – Steady state error – P, PI, PID modes of feed back control.

UNIT III   FREQUENCY RESPONSE   9

Frequency response – Bode plot – Polar plot – Determination of closed loop response from open loop response – Correlation between frequency domain and time domain specifications.

UNIT IV   STABILITY OF CONTROL SYSTEM   9

Characteristics equation – Location of roots in S plane for stability – Routh Hurwitz criterion – Root locus construction – Effect of pole, zero addition – Gain margin and phase margin – Nyquist stability criterion.

UNIT V   COMPENSATOR DESIGN   9

Performance criteria – Lag, lead and lag-lead networks – Compensator design using bode plots.

                                                                    L = 45 T = 15 Total = 60

TEXT BOOKS
1. I.J. Nagrath and M. Gopal, 'Control Systems Engineering', New Age International Publishers, 2007.
2. Benjamin C. Kuo, Automatic Control systems, Pearson Education, New Delhi, 2009.

REFERENCES
1. K. Ogata, 'Modern Control Engineering', 4th edition, PHI, New Delhi, 2009.
2. Norman S. Nise, Control Systems Engineering, 4th Edition, John Wiley, New Delhi, 2007.
3. Samarajit Ghosh, Control systems, Pearson Education, New Delhi, 2004
4. M.Gopal, 'Control Systems, Principles and Design', Tata McGraw Hill, New Delhi, 2006.

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Curriculum & Syllabus for B.E. (EIE) **Regulations-2011**

BEI404	LINEAR INTEGRATED CIRCUITS AND APPLICATIONS	L T P C
	(Common to EEE & EIE)	3 0 0 3

AIM

To introduce the concepts for realizing functional building blocks in ICs, fabrications & application of ICs.

OBJECTIVES

- To study the IC fabrication procedure.
- To study characteristics; realize circuits; design for signal analysis using Op-amp ICs.
- To study the applications of Op-amp.
- To study internal functional blocks and the applications of special ICs like Timers, PLL circuits, regulator Circuits, ADCs.

UNIT I   IC FABRICATION   9

IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Realisation of monolithic ICs and packaging. Fabrication of diodes, capacitance, resistance and FETs.

UNIT II   CHARACTERISTICS OF OPAMP   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 op-amp – summer, differentiator and integrator.

UNIT III   APPLICATIONS OF OPAMP   9

Instrumentation amplifier, first and second order active filters, V/I & I/V converters, comparators, multivibrators, waveform generators, clippers, clampers, peak detector, S/H circuit, D/A converter (R-2R ladder and weighted resistor types), A/D converter - Dual slope, successive approximation and flash types.

UNIT IV   SPECIAL ICs   9

555 Timer circuit – Functional block, characteristics & applications; 566-voltage controlled oscillator circuit; 565-phase lock loop circuit functioning and applications, Analog multiplier ICs

UNIT V   APPLICATION ICs   9

IC voltage regulators - LM317, 723 regulators, switching regulator, MA 7840, LM 380 power amplifier, ICL 8038 function generator IC, isolation amplifiers, opto coupler, opto electronic ICs.

L = 45 Total = 45

TEXT BOOKS

1. Ramakant A.Gayakward, 'Op-amps and Linear Integrated Circuits', 4th Edition, Pearson Education, 2003 / PHI. (2000)
2. D.Roy Choudhary, Sheil B.Jani, 'Linear Integrated Circuits', 2nd Edition, New Age, 2004.

REFERENCES

1. Jacob Millman, Christos C.Halkias, 'Integrated Electronics - Analog and Digital circuits system', Tata McGraw Hill, 2003.
2. Robert F.Coughlin, Fredrick F.Driscoll, 'Op-amp and Linear ICs', Pearson Education, 4th Edition, 2002 / PHI.
3. David A.Bell, 'Op-amp & Linear ICs', Prentice Hall of India, 2nd Edition, 2006

BME404   APPLIED THERMODYNAMICS   L T P C
                                                               3 1 0 4

OBJECTIVES
- To expose the fundamentals of thermodynamics and to be able to use it in accounting for the bulk behaviour of the sample physical systems.
- To integrate the basic concepts into various thermal applications like IC engines, gas turbines, steam boiler, steam turbine, compressors, refrigeration and air conditioning.
- To enlighten the various modes of heat transfer and their engineering applications.
  Use of standard steam tables, refrigeration tables and heat transfer data book are permitted)

UNIT I   BASIC CONCEPTS AND LAWS OF THERMODYNAMICS   12
Classical approach: Thermodynamic systems – Control volume - System and surroundings – Universe – Properties - State-process – Cycle – Equilibrium - Work and heat transfer – Point and path functions - First law of thermodynamics for open and closed systems - First law applied to a control volume - SFEE equations [steady flow energy equation] - Second law of thermodynamics - Heat engines - Refrigerators and heat pumps - Carnot cycle - Carnot theorem.

UNIT II   IC ENGINES   8
Air standard cycles: Otto, diesel and dual cycles and comparison of efficiency – Working Principle of four stroke and two stroke engines - Working principle of spark ignition and compression ignition engines - Application of IC engines.

UNIT III   STEAM BOILERS AND TURBINES   8
Formation of steam - Properties of steam – Use of steam tables and charts – Steam power cycle (Rankine) - Modern features of high-pressure boilers – Mountings and accessories – Testing of boilers. Steam turbines: Impulse and reaction principle – Velocity diagrams – Compounding and governing methods of steam turbines (qualitative treatment only) - Layout and working principle of a steam power plant.

UNIT IV   COMPRESSORS, REFRIGERATION AND AIR CONDITIONING   8
Positive displacement compressors – Reciprocating compressors – Indicated power – Clearance volume – Various efficiencies – Clearance ratio - Volume rate - Conditions for perfect and imperfect intercooling - Multi stage with intercooling – Rotary positive displacement compressors – Construction and working principle of centrifugal and axial flow compressors. Refrigeration - Various methods of producing refrigerating effects (RE) – Vapour compression cycle: P-H and T-S diagram - Saturation cycles - Effect of subcooling and super heating - (qualitative treatment only) - Airconditioning systems – Basic psychrometry - Simple psychrometric processes - Types of airconditioning systems - Selection criteria for a particular application (qualitative treatment only).

UNIT V   HEAT TRANSFER   9
One-dimensional Heat Conduction: Plane wall – Cylinder – Sphere - Composite walls – Critical thickness of insulation –Heat transfer through extended surfaces (simple fins).Convection: Free convection and forced convection - Internal and external flow –Simple Empirical relations. Radiation: Black–Gray bodies - Radiation Shape Factor (RSF) - Cooling of electronic components - Thermoelectric cooling – Chip cooling.

                                             L = 45 T = 15 Total = 60

TEXT BOOKS

1. R.S.Khurmi & J.K.Gupta, Thermal Engineering, S.Chand & Co. Ltd., 2006.
2. S.Domkundwar, C.P.Kothandaraman & A.V.Domkundwar, Thermal Engineering, Dhanpat Rai & Co.2002.

REFERENCES

1. Rogers and Mayhew, 'Engineering Thermodynamics – Work and Heat Transfer', Pearson Education Pvt. Ltd. New Delhi, 2006.
2. Eastop and McConkey, 'Applied Thermodynamics', Pearson Education Pvt. Ltd. New Delhi, 2009.
3. P.K.Nag, 'Engineering Thermodynamics Tata McGraw Hill, New Delhi, 2005.
4. Rajput, B.K. Sankaar, Thermal Engineering, S.Chand & Co. Ltd., 2005.

BEI431   **TRANSDUCERS AND MEASUREMENTS LABORATORY**   **L T P C**
0 0 3 2

OBJECTIVES

The aim of this lab is to train the students in handling the different kinds of transducers like LVDT, Hall effect, Thermocouple etc., which he often meets in his study and also to impart the students an adequate knowledge and work experience of the different types of AC and DC bridges, electronic measurement methods for different electronic instruments.

1. Displacement versus output voltage characteristics of a potentiometric transducer.
2. Characteristics of Strain gauge and Load cell.
3. Characteristics of LVDT, Hall effect transducer and Photoelectric tachometer.
4. Characteristic of LDR, thermistor and thermocouple.
5. Step response characteristic of RTD and thermocouple and Study of smart transducers.
6. Wheatstone and Kelvin's bridge for measurement of resistance.
7. Schering Bridge for capacitance measurement and Anderson Bridge for inductance measurement.
8. Calibration of Single-phase Energy meter and wattmeter.
9. Calibration of Ammeter and Voltmeter using Student type potentiometer.
10. Design, Construction and calibration of series and shunt type ohmmeters.

P = 45 TOTAL = 45

BEI432   LINEAR AND DIGITAL INTEGRATED CIRCUITS LABORATORY   L T P C
                                                                                0 0 3 2

AIM

To study various digital & linear integrated circuits used in simple system configuration.

1.   Study of Basic Digital IC's. (Verification of truth table for AND, OR, EXOR, NOT, NOR, NAND, JK FF, RS FF, D FF)

2.   Implementation of Boolean Functions, Adder/ Subtractor circuits.

3.   Code converters, Parity generator and parity checking, Excess-3, 2s Complement, Binary to Gray code, Encoders and Decoders using suitable IC's .

4.   Counters: Design and implementation of 4-bit modulo counters as synchronous and Asynchronous types using FF IC's and specific counter IC.

5.   Shift Registers: Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable IC's.

6.   Multiplex/ De-multiplex: Study of 4:1; 8:1 multiplexer and Study of 1:4; 1:8 demultiplexer

7.   Timer IC application: Study of NE/SE 555 timer in Astable, Monostable operation.

8.   Application of Op-Amp: Slew rate verifications, inverting and non-inverting amplifier, Adder, comparator, Integrater and Differentiator.

9.   Study of Analog to Digital Converter and Digital to Analog Converter: Verification of A/D conversion using dedicated IC's.

10. Study of VCO and PLL ICs:
     i.   Voltage to frequency characteristics of NE/ SE 566 IC.
     ii. Frequency multiplication using NE/SE 565 PLL IC.

P = 45 Total = 45

BME433   **THERMODYNAMICS LABORATORY**   **L T P C**
                                                   0 0 3 2

THERMODYNAMICS LABORATORY

1. Valve timing and port timing diagrams for IC Engines.

2. Performance test on a Petrol Engine.

3. Performance test on a Diesel Engine.

4. Heat Balance test on an IC Engine.

5. Boiler – performance and Heat Balance Test.

6. Performance test on a Refrigerator (Determination of COP)

7. Determination of heat transfer Coefficient (Free and forced convection)

8. Test to estimate frictional losses in pipe flow.

9. Test on reaction turbine for obtaining the characteristics curves and to design values of specific speed, discharge, output and efficiency.

10. Test on impulse turbine to obtain its characteristics curves and hydraulic design values.

P = 45 Total = 45

BEG431   COMMUNICATION SKILLS AND TECHNICAL SEMINAR – II   L T P C
(Common to all branches)   **0 0 3 2**
(To be conducted as a Practical Paper by the Depts of English for 3 hrs per week)

OBJECTIVES:
- To improve the learners' oral fluency in English
- To help the learners acquire the readiness to speak in English
- To develop the sub-skills required for paper presentations and group discussions
- To help the learners improve their vocabulary related to specific fields of technology
- To facilitate the development of the learners' proficiency in meaningful interaction
- To provide them linguistic support for managing vital sub-functions of communication.

COURSE CONTENT:
A) Phonetic practice (7 hrs)
All the English phonemes with special emphasis on the following
1. /ae/ and /ei/
2. /e/ and /i/
3. First syllable and second syllable stress
4. Three different ways of pronouncing 'ed' past tense endings eg. *'played', 'walked', 'wanted'*
5. Correct pronunciation of commonly used words (A list of 1000 words will be suggested by the university)
6. Silent letters

B) Speech practice (8 hrs)
Speaking on the themes by developing the hints provided.
The themes are:
1. Indian space missions
2. Converting agricultural wastes for useful purposes
3. Developments in transportation
4. Technology and agriculture
5. Impact of global warming
6. Desalination of water
7. Technology for national security
8. Industrial development and ecological issues
9. Applications of nano technology
10. Hazards of e-waste

C) Preparation of power point frames on the given topic (2 hrs)
(Only pictures, graphs, equations should be given through power point and not the text of the presentation as such)

D) Language Functions (14 hrs)
Reporting the conversation of others
Using the third conditional
Expressing agreement and disagreement
Numerical expressions
Describing manner and frequency
Evaluating different standpoints

Developing an argument

Describing daily routines, events, and weather

D) Seminar presentation on the themes allotted using power point frames (14 hrs)
PROCEDURE:
A) Phonetic practice

The learners should be given drills in the pronunciation of at least 30 words for each sound. While practising stress patterns, they should be encouraged to identify as many words as possible for each pattern.

B) Speech practice

Every student should be allowed to choose one theme to specialize in. (However not more than 7 students in a section can choose the same theme).The teacher has to prepare at least 4 hints development tasks on each theme and should provide chance to each learner to speak on those hints related to his/ her theme (5 minutes).The hints may be supplied to the students in advance. When a student speaks, the class should be encouraged to ask questions as well as note down the words related to the different fields.

C) Language Functions

The teacher should build micro activities to develop the use of language required to handle these sub-functions of communication. In the process, the learners should get used to the linguistic elements needed for these functions.

D) Seminar presentation on the themes allotted

Each student should collect materials from books, journals and newspapers for his/her theme and prepare a short seminar paper. The presentation should be for 10 minutes using power point frames. It should be followed by an 'open house' during which others should come forward to question, clarify, supplement or evaluate.

RECORD LAY OUT:

Every student has to maintain a record in which he/she has to incorporate the following details.

- First page containing learner details and the topic of specialization.
- Twenty words for each phoneme /ae/, /ei/, /i/ and /e/
- Fifty words with first syllable stress and fifty for second syllable stress (The learner will be required to pronounce some of these words during the practical exam)
- Vocabulary list (technical words and compound words) related to the 10 themes identified for this semester.
- Three newspaper items, two journal items and three internet sources related to the special theme selected by the student.(To be pasted on the pages)
- The seminar paper presented by the learner with a soft copy of the power point frames.
- Notes of observation. (Details about any two seminar paper presentations by others)
- The record should be duly signed by the course teacher and submitted to the External Examiner for verification during the semester practicals.

P = 45 Total = 45

National Engineering College (An Autonomous Institution, Affiliated to Anna University, Chennai), K.R.Nagar, Kovilpatti

Curriculum & Syllabus for B.E. (EIE)   Regulations-2011

BEI501   INDUSTRIAL INSTRUMENTATION – II   L T P C
                                                                                                         3 0 0 3

OBJECTIVE:
- To expose students to mechanical flow meters, mass flow meters and electrical type flow meters and different techniques for solid and liquid level measurements, viscosity and humidity measurements.

UNIT I   VARIABLE HEAD TYPE FLOWMETERS   9
Theory of fixed restriction variable head type flow meters:- principle of operation of orifice flow meter - Types, Machining methods and position of taps in orifice plates - Principle of operation of venturi flow meters, Types of venturi tubes – Installation of head flow meters – Principle, construction and application of Flow nozzle , Dall tube and Pitot tube.

UNIT II   QUANTITY METERS, AREA FLOW METERS AND MASS FLOW METERS   9
Positive displacement flow meters: – Nutating disc, Reciprocating piston, Oval gear and Helix type flow meters – Inferential meter – Turbine flow meter – Area flow meter:- Rotameter – Theory and installation – Mass flow meters:- Angular momentum, Thermal and Coriolis – Calibration of flow meters:– Dynamic weighing methods.

UNIT III   ELECTRICAL TYPE FLOW METER   9
Principle and constructional details of Electromagnetic flow meter – Ultrasonic flow meters – Laser Doppler anemometer – Vortex shedding flow meter – Target flow meter – Guidelines for selection of flow meter - Open channel flow measurement – Solid flow rate measurement.

UNIT IV   LEVEL MEASUREMENT   9
Level measurement:- Float, Displacer type and Bubbler system – Electrical level gauge:- Resistance and Capacitance – Nuclear radiation and Ultrasonic types – Radar Level Transmitters – Vibration and microwave level switches - Boiler drum level measurement:- Differential Pressure Method and Hydrostatic types – Solid level measurement.

Leading manufactures of flow and level instruments with specifications. (Non-descriptive)

UNIT V   MEASUREMENT OF VISCOSITY, HUMIDITY AND MOISTURE   9
Viscosity:- Say bolt viscometer and Rotameter type viscometer – Consistency meters – Dry and wet bulb psychrometers – Hot wire electrode type hygrometer, Dew cell and Electrolysis type hygrometer – Commercial type dew point meter – Moisture measurement:- Infrared absorption hygrometer, microwave absorption hygrometer-Nuclear moisture gauge - Application of moisture measurement.

                                                                         L: 45   TOTAL: 45 PERIODS

TEXT BOOKS
1. Doeblin, E.O., "Measurement Systems Application and Design", International Student Edition, 5th Edition, McGraw-Hill Book Company, 2004.
2. Patranabis, D., "Principles of Industrial Instrumentation", 3rd Edition, Tata McGraw-Hill Company Limited, 2011.

REFERENCES
1. Liptak, B.G., "Instrumentation Engineers Handbook (Measurement)", CRC Press, 2005.
2. Jain, R.K., "Mechanical and Industrial Measurments", Khanna Publishers, Delhi, 1999.
3. Eckman, D.P., "Industrial Instrumentation", Wiley Eastern Limited, 1990.

BEI502 **DIGITAL SYSTEM DESIGN** **L T P C**

3 1 0 4

OBJECTIVES:

- To build the basics of digital systems design with a focus on FPGA design.
- To understand the combinational and sequential hardware system design.

UNIT I DIGITAL LOGIC FAMILIES **12**
TTL, CMOS, NMOS, Dynamic MOS, ECL, I2L, Operating conditions, Parameters, Interpreting data sheets. Power supply grounding considerations for digital ICs, TTL – to – CMOS Interface, CMOS – to – TTL interface.

UNIT II DIGITAL MEMORIES **12**
The role of Memory in a system – memory types and terminology – ROM – types of ROM – RAM – SRAM – DRAM – Expanding word size and capacity – Applications.

UNIT III SYSTEM DESIGN USING PLDs AND CPLDs **12**

Structure of Standard PLDs and Complex PLDs (CPLDs) – Design of combinational and sequential circuits using PLDs and CPLDs – Design of state machines using Algorithmic State Machines (ASM) chart as a design tool.

UNIT IV INTRODUCTION TO FIELD PROGRAMMABLE GATE ARRAYS (FPGAs) 12
Types of FPGA – Xilinx XC3000 series – Logic Cell Array (LCA) – Configurable Logic Blocks (CLB) – Input/Output Blocks (IOB) – Programmable Interconnection Points (PIP) – Introduction to ACT 2 family and Xilinx SPARTAN, VIRTEX, FPGA – Design examples.

UNIT V TESTING IN DIGITAL CIRCUITS AND DESIGN FOR TESTABILITY **12**
Detection and location of faults in combinational logic circuits –Stuck-at-fault model – Path sensitising method – Boolean difference method – Fault detection and location in synchronous sequential circuits – Design for testability – Adhoc techniques – Scan registers – Level Sensitive Scan Design – Boundary Scan -Built-in-self test.

L: 45   T: 15   TOTAL: 60 PERIODS

TEXT BOOKS
1. Charles H.Roth, "Fundamentals Logic Design", 4th Edition, Jaico Publishing, 2002.
2. Donald. P. Leach, Albert paul Malvino, Goutam Suha,"Digital Principles and Applications", 6th Edition, Tata McGraw –Hill , 1997 .
3. Miron Abramonici, Melvin. A. Rrewer, Arthur.D. Friedman, "Digital system testing and testable design", Jaico publishing house, 2002.
4. Robert K Dueck, "Digital Design with CPLD applications and VHDL", Thomson Asia, 2002.

REFERENCE BOOK
1. Theodore. F. Bogart, "Introduction to Digital Circuits", McGraw – Hill International Edn, 1992.

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Curriculum & Syllabus for B.E. (EIE)   Regulations-2011

BEI503   MICROPROCESSOR AND MICROCONTROLLER PROGRAMMING   L T P C
                                                                                                         3 1 0 4

OBJECTIVES:

- To lay an in-depth foundation of 8 bit microprocessor using 8085 family and to develop skill in simple program writing for applications.
- To introduce commonly used peripheral / interfacing ICs
- To study the Architecture of Intel 8051 family of 8 bit microcontroller and peripheral programming using SFR

UNIT I   8085 MICROPROCESSOR AND ADVANCED MICROPROCESSORS   12

Introduction to 8085 – Architecture, Instruction set, Addressing modes, Interrupts, Timing diagram, memory and I/O interfacing – Programming exercises in 8085. Overview of Microprocessors Architectures:- 8086, 80486.

UNIT II   PERIPHERAL INTERFACE PROGRAMMING   12
Programmable Peripheral Interface (8255) - USART (8251) – Programmable interval timer (8253) - Programmable DMA Controller (8257) - Programmable Interrupt controller (8259) - Keyboard display controller (8279)

UNIT III   ARCHITECTURE AND PROGRAMMING OF 8051 MICROCONTROLLER   12

Architecture - Memory Organization - Special function Registers (SFR) - I/O pins, ports and circuits - Addressing modes -Instruction set - Boolean processing- Assembly language programming.

UNIT IV   8051 PERIPHERALS PROGRAMMING   12

Timer and Counter Programming - Serial Communication programming - Interrupts programming - External Memory Interface – Interfacing of keyboard and liquid crystal display.

UNIT V   MICROPROCESSOR BASED SYSTEMS DESIGN   12

Microprocessor based Data acquisition system - Implementation of discrete Control sequence – Implementation of Digital PID Algorithm - Stepper Motor Interfacing - Temperature control system - Case studies in Industrial Process Control Systems.

L: 45   T: 15   TOTAL: 60 PERIODS

TEXT BOOKS

1. Gaonkar, R.S., "Microprocessor Architecture Programming and Application", 5th Edition, Wiley Eastern Ltd., New Delhi, 2002.
2. Hall, D.V., "Microprocessor and Interfacing, Programming and Hardware", 2nd Edition, Tata McGraw-Hill, 1999.
3. Ayala, K.J., "The 8051 Microcontroller Architecture and Programming Applications", Penram International Publishing (India) Pvt. Ltd, 2004.

REFERENCES

1. Hint, K. and Tabak, D., "Microcontrollers, Architecture, Implementation and Programming", McGraw - Hill International, USA, 1992.
2. Mazidi, M.A. and Mazidi, J.G., "The 8051 Microcontroller and Embedded Systems", Prentice Hall, 2000.

BEI504   COMMUNICATION SYSTEMS   L T P C
                                                                                           3 0 0 3
OBJECTIVES:

- To understand basic signals, analog modulation, demodulation and radio receivers.
- To introduce Digital Communication methods for high bit rate transmission
- To introduce the concepts of source and line coding techniques for enhancing rating of transmission of minimizing the errors in transmission.
- To learn the basics of satellite communication systems.
- To introduce the concepts of biomedical telemetry system.

UNIT I   ANALOG MODULATION SYSTEMS   9
Amplitude modulation and demodulation- generation of AM - AM Transmitter & Receiver - Frequency spectrum, frequency modulation and demodulation- frequency spectrum- super heterodyne radio receiver. Frequency division multiplexing. Time Division multiplexing.

UNIT II   DIGITAL COMMUNICATION   9
Pulse code modulation, digital T-carrier system. Digital radio system. Digital modulation: Amplitude Shift Key, Frequency and phase shift keying, Quadrature Phase Shift Key – Modulator and demodulator.

UNIT III   SOURCE CODES, LINE CODES & ERROR CONTROL (Qualitative only)   9
Primary communication – entropy, properties, BSC, BEC, source coding : Shaum, Fao, Huffman coding : noiseless coding theorem, BW – SNR trade off codes: NRZ, RZ, AMI, HDBP, ABQ, MBnB codes : Efficiency of transmissions, error control codes and applications: convolutions & block codes.

UNIT IV   SATELLITE COMMUNICATION SYSTEM   9
Introduction to satellite communication, Satellite Sub system, Earth station, Classification of multiple access techniques – FDMA, TDMA, CDMA, SDMA- Satellite applications- GPS

UNIT V   BIOMEDICAL TELEMETRY SYSTEM   9
Components of telemetry system, Bio-telemetry and its importance, Single and multi-channel biotelemetry, ECG telemetry system, Temperature telemetry system, Telemetry of Respiration, Multi-patient telemetry, Implantable telemetry for blood pressure and blood flow systems, transmission of analog physiological signals over telephone line, Essential parameter for telemedicine and applications.

                                                                    L: 45   TOTAL: 45 PERIODS

TEXT BOOKS
1. J.Das "Principles of digital communication", New Age International, 1986.
2. Herbert Taub & Donald L Schilling – "Principles of Communication Systems", 3rd Edition, Tata McGraw Hill, 2008.
3. Taub & Schiling "Principles of communication systems", Tata McGraw hill 2007.
4. Dennis Roddy "Satellite Communication", 4th Edition, Tata McGraw Hill, 2009.

REFERENCES
1. Kennedy and Davis "Electronic communication systems" 4th Edition, Tata McGraw Hill, 1993.
2. Sklar "Digital communication fundamentals and applications", Pearson Education, 2001.
3. Bary le, Memuschmidt, "Digital Communication", Kluwer Publication, 2004.
4. B.P.Lathi "Modern digital and analog communication systems" Oxford University Press, 1998.
5. William Schweber, "Electronic Communication Systems", Prentice Hall of India, 2002.
6. R.S.Khandpur, "Handbook of Biomedical Instrumentation", 2nd Edition, Tata McGraw hill, 2003.

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Curriculum & Syllabus for B.E. (EIE)   Regulations-2011

BCS302   **OBJECT ORIENTED PROGRAMMING**   **L T P C**
(Common to 3rd Sem – CSE & IT, 5th Sem – EIE, 6th Sem – EEE)   **3 0 0 3**

OBJECTIVES
- To explore the OOP concepts
- To illustrate the techniques which form the OOP paradigm
- To develop ability to apply OOP concepts using C++
- To work with real-time applications using advanced features of C++ such as Exception handling, Templates and File Streams.

UNIT I BASICS OF OBJECT – ORIENTED PROGRAMMING   9
Object oriented programming concepts – objects – classes – methods and messages – abstraction and encapsulation – inheritance – abstract classes – polymorphism. Introduction to C++ – classes – access specifiers – function and data members – default arguments – function overloading – friend functions – const and volatile functions – static members – Objects - pointers and objects – constant objects – nested classes – local classes.

UNIT II CONSTRUCTORS AND FUNCTION OVERLOADING   9
Constructors – default constructor – Parameterized constructors – Constructor with dynamic allocation – copy constructor – destructors – operator overloading – overloading through friend functions – overloading the assignment operator – type conversion – explicit constructor.

UNIT III TEMPLATES AND EXCEPTION HANDLING   9
Function and class templates – Exception handling – try-catch-throw paradigm – exception specification – terminate and Unexpected functions – Uncaught exception.

UNIT IV INHERITANCE   9
Inheritance – public, private, and protected derivations – multiple inheritance – virtual base class – abstract class – composite objects Runtime polymorphism – virtual functions – pure virtual functions – RTTI – typeid – dynamic casting – RTTI and templates – cross casting – down casting .

UNIT V I/O STREAMS   9
Streams and formatted I/O – I/O manipulators – file handling – random access – object serialization – namespaces – std namespace – ANSI String Objects – standard template library.

L =45 Total = 45 Periods

TEXT BOOK
1. Trivedi B., "Programming with ANSI C++", Oxford University Press, 2007.

REFERENCES
1. Ira Pohl, "Object Oriented Programming using C++", 2nd Edition, Pearson Education, Reprint 2004.
2. Lippman S. B., Josee Lajoie and Barbara E. Moo, "C++ Primer", 4th Edition, Pearson Education, 2005.
3. Stroustrup B., "The C++ Programming language", 3rd Edition, Pearson Education, 2004.

BGE501	PROFESSIONAL ETHICS AND HUMAN VALUES	L	T	P	C

BGE501   PROFESSIONAL ETHICS AND HUMAN VALUES
(Common to 5th Sem – EEE, EIE, Civil & IT   **L   T   P   C**
6th Sem – CSE & ECE)   **3   0   0   3**

OBJECTIVES:
- To create awareness on Engineering Ethics and Human Values.
- To instill Moral and Social Values and Loyalty
- To appreciate the rights of others

UNIT I   HUMAN VALUES   10
Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality.

UNIT II   ENGINEERING ETHICS   9
Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories.

UNIT III   ENGINEERING AS SOCIAL EXPERIMENTATION   9
Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study

UNIT IV   SAFETY, RESPONSIBILITIES AND RIGHTS   9
Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island and chernobyl case studies. Collegiality and loyalty - respect for authority - collective bargaining – confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

UNIT V   GLOBAL ISSUES   8
Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers - consulting engineers - engineers as expert witnesses and advisors -Moral leadership-sample code of Ethics of ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers (IETE), India.

TOTAL: 45 PERIODS

TEXT BOOKS
1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York 1996.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

REFERENCES
1. Charles D. Fleddermann, "Engineering Ethics", Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint)
2. Charles E Harris, Michael S.Protchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available).
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.
4. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.

BEI531	**MICROPROCESSOR AND MICROCONTROLLER**	**L T P C**
	PROGRAMMING LABORATORY	**0 0 3 2**

OBJECTIVES:
- To introduce the hardware & software design basics of microprocessor and microcontroller.
- To understand the concepts of low level programming and its applications in engineering.

LIST OF EXPERIMENTS:
1. Study of 8085 Microprocessor kit

2. 8085 Assembly Language Programming Exercises.
    - Multi byte Binary Addition and Subtraction in 8085
    - Multi byte BCD Addition and subtraction in 8085
    - Table Processing using 8085
    - Multiplication and Division in 8085

3. Interfacing with 8085
    - Waveform Generation using 8255 and Display unit
    - Interfacing 8255 and 8253 with 8085.
    - Interfacing 8279 and 8251 with 8085.
    - Interfacing 8259 with 8085.
    - Interfacing Stepper motor with 8085.

4. 8051 Assembly Language Programming Exercises.
    - Addition and subtraction in 8051
    - Multiplication and Division in 8051
    - Programming 8051 on chip peripherals
    - Interfacing Stepper motor with 8051

5. Interfacing ADC with Microprocessor and Microcontroller.

6. Interfacing DAC with Microprocessor and Microcontroller.

7. Microprocessor based Data Logger.

8. Microprocessor based Traffic light controller.

9. Microprocessor based PID controller.

10. LCD Display Interface with 8051.

P: 45   TOTAL: 45 PERIODS

BCS332   **OBJECT ORIENTED PROGRAMMING LABORATORY**   **L T P C**
                 (Common to 3ʳᵈ Sem – CSE & IT, 5ᵗʰ Sem – EIE, 6ᵗʰ Sem – EEE)   **0 0 3 2**

OBJECTIVES
- To provide fundamental knowledge and skills to practice C++ programming.
- To develop ability to solve real-time problems using OOPs concepts.
- To have an understanding and hands-on practice in advanced concepts of C++

LIST OF EXPERIMENTS
a. Design C++ classes with static members, methods with default arguments, friend functions. (For example, design matrix and vector classes with static allocation, and a friend function to do matrix-vector multiplication)
b. Implement complex number class with necessary operator overloading and type conversions such as integer to complex, double to complex, complex to double etc.
c. Implement Matrix class with dynamic memory allocation and necessary methods. Give proper constructor, destructor, copy constructor, and overloading of assignment operator.
d. Overload the new and delete operators to provide custom dynamic allocation of memory.
e. Develop a template of linked-list class and its methods.
f. Develop templates of standard sorting algorithms such as bubble sort, insertion sort, merge sort, and quick sort.
g. Design stack and queue classes with necessary exception handling.
h. Define Point class and an Arc class. Define a Graph class which represents graph as a collection of Point objects and Arc objects. Write a method to find a minimum cost spanning tree in a graph.
i. Develop with suitable hierarchy, classes for Point, Shape, Rectangle, Square, Circle, Ellipse, Triangle, Polygon, etc. Design a simple test application to demonstrate dynamic polymorphism and RTTI.
j. Write a C++ program that randomly generates complex numbers (use previously designed Complex class) and writes them two per line in a file along with an operator (+, -, *, or /). The numbers are written to file in the format (a + ib). Write another program to read one line at a time from this file, perform the corresponding operation on the two complex numbers read, and write the result to another file (one per line).

Total = 45 Periods

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Curriculum & Syllabus for B.E. (EIE)   Regulations-2011

BEI601   **ANALYTICAL INSTRUMENTATION**   **L T P C**
                                                                                      3 0 0 3

OBJECTIVES:
- To study the various techniques of spectral analysis in the various regions of the EM spectrum.
- To learn unique methods of separation of closely similar materials i.e. chromatographic techniques and to gain the knowledge of electromagnetic resonance methods of analysis.
- To study important methods of analysis of industrial gases and environmental air pollution monitoring.
- To bring out the latest ideas on ion-selective electrodes which are used in chemical analysis.
- To gain the knowledge of microscopic methods of analysis in a complex mixture.

UNIT I   COLORIMETRY AND SPECTROPHOTOMETRY   9
Elements of an analytical instrument – Beer-Lambert law – Colorimeters – UV-Visible spectrophotometers – Sources and detectors, Single and double beam instruments – IR Spectrophotometers – Sources and detectors, Types-Attenuated Total Reflectance technique, FTIR Spectrophotometer – Atomic Absorption Spectrophotometer – Flame Photometer, Fluorescence Spectroscopy – Single and double beam filter fluorimeters.

UNIT II   CHROMATOGRAPHY AND ELECTRO MAGNETIC RESONANCE
**   TECHNIQUES   9**
Chromatography techniques – Gas Chromatography – High-Performance Liquid Chromatography – Electro Magnetic Resonance techniques – Nuclear Magnetic Resonance (NMR) spectrometer – Basic principle, Instrumentation and applications, Electron Spin Resonance (ESR) spectrometer – Basic principle, Instrumentation and applications.

UNIT III   INDUSTRIAL GAS ANALYZERS AND POLLUTION MONITORING
**   INSTRUMENTS   9**
Types of gas analyzers – Paramagnetic Oxygen analyzer, IR analyzer, Thermal conductivity analyzer, Analysis based on ionization of gases – Pollution monitoring instruments – Estimation of Carbon monoxide, Hydrocarbons, Nitrogen oxides, Sulphur dioxide – Measurement of Total Dissolved Solids (TDS) – Gravimetry method and Conductivity method.

UNIT IV   pH METERS AND RADIATION DETECTORS   9
Types of pH meter – Null indication type, Chopper amplifier type, Digital pH meter – Electrodes – Glass electrode, Reference electrodes – Selective ion electrodes – Solid state electrode, Ammonia electrode – Biosensors – Radiation detectors – Ionization chamber, Geiger Muller counter, Proportional counter, Scintillation counter.

UNIT V   MICROSCOPIC TECHNIQUES   9
Scanning Electron Microscope (SEM) – Basic principle, Instrumentation and applications – Transmission Electron Microscope (TEM) – Basic principle, Instrumentation and applications – Mass spectrometer – Basic principle, Types-Magnetic deflection and Time of flight, Applications.

                                                      L: 45 TOTAL: 45 PERIODS
TEXT BOOKS
1. R.S. Khandpur, "Handbook of Analytical Instruments", 2nd Edition, Tata McGraw Hill publishing Co. Ltd., 1996.
2. G.W. Ewing, "Instrumental Methods of Chemical Analysis", McGraw Hill, 1992.
3. Braun Robert D., "Introduction to Instrumental Analysis", McGraw-Hill, 1987.
4. H.H. Willard, L.L. Merritt, J.A. Dean, F.A. Settle, "Instrumental Methods of Analysis", CBS publishing & distribution, 1995.

REFERENCE BOOK
1. Liptak, B.G, "Process Measurement and Analysis", Chilton Book Company, 1995.

BEI602   MODERN ELECTRONIC INSTRUMENTATION   L T P C
3 0 0 3

OBJECTIVES:
- To make the students to gain a clear knowledge of the basics of digital instruments and measurement techniques.
- To have an adequate knowledge in various display and recording devices.
- To have an elaborate study of communication standards
- To have a study of virtual instrumentation and its applications.

UNIT I   DIGITAL INSTRUMENTS   9
Digital voltmeters-Ramp, Dual slope integrating, Integrating, Successive Approximation and Microprocessor based Ramp type DVM – Resolution and Sensitivity of Digital Meters- Automation in Digital Instruments- Digital IC tester –Frequency Meter, Measurement of time-Ratio and Multiple Ratio Measurements.

UNIT II   DISPLAY AND RECORDING DEVICES   9
Cathode ray oscilloscope – Basic Principle, Block Diagram, Simple CRO,Dual Beam and Dual Trace – Sampling ,Storage and Digital Storage oscilloscope –Seven segment and dot matrix display – X-Y recorders – Magnetic tape recorders – Digital recording and data loggers.

UNIT III   WAVE ANALYZERS AND SIGNAL GENERATORS   9
Wave analyzers – Basic, Frequency Selective and Heterodyne - Signal Generators – Standard, Modern Laboratory Signal Generator, AF Sine and Square Wave, Function Generator, Square and Pulse Generator-Harmonic Distortion Analyzer – Q meter –Random noise generator.

UNIT IV   RS 232 AND RS 485   9
Modern instrumentation and control systems - Virtual instrumentation – Definition – Block diagram and architecture of virtual instruments – Virtual instruments versus traditional instruments –Pallets in VI – OSI model – EIA 232 Interface standard -EIA 485 Interface standard - EIA 422 Interface standard – 20 mA current loop – Serial Interface converters.

UNIT V   DATA ACQUISITION CARDS   9
DAQ Analog and Digital cards for VI applications – Requirements – General block diagram of DAQ - Design of digital voltmeters with transducer input – Design of ON/OFF controller for temperature control applications

L: 45   TOTAL: 45 PERIODS

TEXT BOOKS
1. Rick Bitter, Taqi Mohiuddin and Matt Nawrocki, "Labview Advanced Programming Techniques", 2nd Edition, CRC Press, 2007.
2. S.Gupta and J.P. Gupta, "PC interfacing for data acquisition and process Control", 2nd Edition, Instrument Society of America, 1994.
3. Kalsi H.S., "Electronic Instrumentation", 2nd Edition, Tata Mc Graw Hill Company, New Delhi, 2004.

REFERENCES
1. Rahman Jamal and Herbert Picklik, "LabVIEW – Applications and Solutions", National Instruments Release ISBN 0130964239.
2. William Buchanan "Computer Busses", CRC Press, 2000.
3. Rangan C.S., Sharma G.R., Mani V.S.V., "Instrumentation devices and Systems", Tata Mc Graw Hill Company, New Delhi, 2002.
4. Joseph J Carr, "Elements of Electronic Instrumentation and Measurement", 3rd Edition, Pearson Education, 2003.

5. David A. Bell, "Electronic Instrumentation and measurements", 2nd Edition, Prentice   Hall of India, New Delhi, 2003.
6. Gupta J.B., "A course in Electrical and Electronic Measurement and Instrumentation", 12th Edition, Katson Publishing House, 2003.

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Curriculum & Syllabus for B.E. (EIE)   **Regulations-2011**

BEI603   **PROCESS CONTROL**   **L T P C**

                                                                                                   3 1 0 4

OBJECTIVES:
- To analyze the dynamics of process operations mathematically
- To analyze the characteristics of various controller
- To design the controller and to obtain the controller parameter
- To understand control schemes and analyse its performance
- To know about the final control element performance

UNIT I   DYNAMICS OF PROCESS   12

Need for process control – Process with dead time, Process with inverse response – Continuous and Batch process – Degree of freedom - Servo and Regulator operation - Mathematical model of first order liquid level and thermal processes – Higher order process – Interacting and non-interacting systems – P&ID symbols.

UNIT II   CHARACTERISTICS OF CONTROLLER   12

Control System parameter - Basic control action – Characteristics of Discontinuous controller modes – Two position mode – Multiposition mode – Floating controller mode - Characteristics of continuous controller - Proportional, Integral and Derivative control modes – Composite control modes – P+I, P+D and P+I+D control modes

UNIT III   ANALOG CONTROLLER & TUNING   12

Electronic controllers to realize various control actions – Pneumatic Controllers - Simple performance criteria – IAE, ISE, ITAE and ¼ decay ratio – Tuning of controllers – Ziegler-Nichol's method and Cohen Coon method.

UNIT IV   CONTROL SYSTEMS WITH MULTIPLE LOOPS   12

Cascade control – Feed forward control – Ratio control – Selective control systems – Split range control – Adaptive and inferential control - Case study of control schemes of binary distillation column.

UNIT V   FINAL CONTROL ELEMENT   12

Final control operation – Signal conversion - I/P converter – Pneumatic and electric actuators – Valve positioner – Control valves characteristics – Classification of control valves – Control valve sizing – Cavitations and flashing – Selection of control valves.

L: 45   T: 15   TOTAL: 60 PERIODS

TEXT BOOKS
1. Curtis.D.Johnson, "Process Control Instrumentation Technology", 7th Edition, Pearson Education, New Delhi, 2002.
2. G.Stephanopoulis, "Chemical Process Control", Prentice Hall of India, New Delhi, 1990.

REFERENCES
1. B.G.Liptak, "Process Control", Chilton Book Company, 1994.
2. Donald P. Eckman, "Automatic Process Control", Wiley Eastern Ltd., New Delhi, 1993.
3. J.G.Balchen and K.J.Mumme, "Process Control structures and Application", Van nostrand Reinhold Co., New York, 1988.

BEI604   DIGITAL SIGNAL PROCESSING SYSTEMS   L T P C
3 1 0 4

OBJECTIVES:
- To classify signals and systems & their mathematical representation.
- To analyse the discrete time systems.
- To study various transformation techniques & their computation.
- To study about filters and their design for digital implementation.
- To study about a programmable digital signal processor.

UNIT I   INTRODUCTION   12
Mathematical representation of Continuous and discrete time signals: Classification of Signals – Periodic aperiodic even – odd – energy and power signals – Deterministic and random signals – complex exponential and sinusoidal signals – periodicity – spectral density; sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect. Digital signal representation, Analog to Digital Conversion.

UNIT II   ANALYSIS OF DISCRETE TIME SYSTEM   12
Z-transform and its properties, inverse z-transforms; difference equation – Solution by   z-transform, application to discrete systems - Stability analysis, frequency response – Convolution – Fourier transform of discrete sequence – Discrete Fourier series.

UNIT III   DISCRETE FOURIER TRANSFORM & COMPUTATION   12
Introduction to DFT – DFT Properties – magnitude and phase representation- Computation of DFT using FFT algorithms – FFT algorithms using Radix-2– Decimation in Time and Decimation in Frequency algorithms –Butterfly structure(4 and 8 point)

UNIT IV   DESIGN OF DIGITAL FILTERS   12
FIR & IIR filter realization – Parallel & cascade forms. FIR design: Windowing Techniques – Need and choice of windows – Linear phase characteristics. IIR design: Analog filter design - Butterworth and Chebyshev approximations; digital design using impulse invariant and bilinear transformation - Warping, prewarping - Frequency transformation.

UNIT V   DIGITAL SIGNAL PROCESSORS   12
Architecture for signal processing – Van Neumann and Harvard architecture; Architecture and features of TMS 320C54 signal processing chip.

L: 45   T: 15   TOTAL: 60 PERIODS

TEXT BOOKS
1. J.G Proakis and D.G.Manolakis, "Digital Signal Processing Principles, Algorithms and Applications", Pearson Education, New Delhi, 2003.
2. S.K. Mitra, "Digital Signal Processing – A Computer Based Approach", Tata McGraw Hill, New Delhi, 2001.

REFERENCES
1. Alan V. Oppenheim, Ronald W. Schafer and John R. Buck, "Discrete – Time Signal Processing", Pearson Education, New Delhi, 2003.
2. B.Venkataramani, M.Bhaskar, "Digital Signal Processors, Architecture, Programming and Applications", Tata McGraw Hill, New Delhi, 2003.
3. S.Salivahanan, A.Vallavaraj, C.Gnanapriya, "Digital Signal Processing", Tata McGraw Hill, New Delhi, 2003.
4. Johny R.Johnson, "Introduction to Digital Signal Processing", Prentice Hall, 1984
5. Texas TMS 320C54X user manual (website).

BEI631   INDUSTRIAL INSTRUMENTATION AND TELEMETRY LABORATORY
L T P C
0 0 3 2

OBJECTIVES:
- To develop an understanding of measurement and calibration procedure, the methods of experimentation and analysis of experimental data for industrial process.
- To promote teamwork

LIST OF EXPERIMENTS:

1. Determination of Discharge coefficient of Orifice plate and Venturi meter.

2. Measurement of flow rate using Pitot tube.

3. Measurement of pH

4. Measurement of Conductivity.

5. UV-Visible Spectrophotometer

6. Level Measurement using Differential pressure Transmitter.

7. Pressure gauge calibration using Dead Weight Tester.

8. Calibration of Rotameter

9. Calibration of Thermocouple

10. Measurement of vacuum pressure.

11. Determination of Viscosity using Saybolt/Redwood viscometer.

12. Torque measurement

13. Generation of Amplitude Modulation

14. Generation of Frequency Modulation

15. Generation of Pulse Amplitude Modulation

16. Generation of Unit Impulse Signal and Sine Signal

P: 45   TOTAL: 45 PERIODS

BEI632   **COMPUTER CONTROL OF PROCESS LABORATORY**   **L T P C**
                                                                                                   0 0 3 2

OBJECTIVES:
- To strengthen the knowledge in Mathematical Modeling
- To strengthen the practical knowledge in process control
- To study the characteristics of Process Components

LIST OF EXPERIMENTS:

1. Dynamics of first and second order systems

2. Simulation of different order processes with and without transportation lag

3. Characteristics of various transmitter

4. Realization of on-off controller using operational amplifier

5. Realization of P+I+D controller using operational amplifier

6. Characteristics of control valve with and without positioner

7. Closed loop response of flow control loop

8. Closed loop response of level control loop

9. Closed loop response of temperature control loop

10. Closed loop response of pressure control loop

11. Tuning of controllers

12. Study of complex control system (ratio / cascade / feed forward)

                                                        P: 45   TOTAL: 45 PERIODS

BEI001 **INDUSTRIAL DRIVES AND CONTROL** **L T P C**
3 0 0 3

OBJECTIVES:
- To provide solid introduction of different types of power switching devices.
- To study the operation of rectifier, chopper and PWM inverter circuit
- To know the characteristics of DC and AC drives.

UNIT I POWER DEVICES **9**
Power diode (characteristics and types)– Power transistor – Power MOSFET – IGBT(basic structure and working, device characteristics and switching characteristics)- SCR – TRIAC – GTO — MCT (static V-I and switching characteristics)– Protection of power devices (snubber circuit, overvoltage and overcurrent protection, gate protection).

UNIT II CONVERTERS **9**
Introduction to half wave, full wave and bridge rectifiers – Single phase– Half controlled and Fully controlled converters (R, RL, RLE load with and without freewheeling diode) -Three phase (semi converter and full converter) – Dual converters – Introduction to cycloconverters (single phase step up and step down cycloconverter and three phase cycloconverter)and ac controllers.

UNIT III INVERTER AND CHOPPER **9**
Voltage, current and load commutation – Voltage Source Inverter (VSI) – Series and Parallel inverter – Bridge inverters – single and three phase – Voltage control using PWM – Current Source Inverter (CSI) – Choppers – Step up and step down choppers – Chopper classification – Class A, B, C, D, E – AC choppers.

UNIT IV DC AND AC DRIVES **9**
Steady state characteristic of dc motors – Control of DC motor using converters and choppers Regenerative and dynamic braking – Closed loop control scheme – Speed-torque characteristic of induction motor – Static stator voltage control – V/f control – Static rotor resistance control – Slip power recovery scheme – Self control of synchronous motor.

UNIT V OTHER APPLICATIONS **9**
Electronic timers – Digital counters – Voltage regulators – online and offline UPS – Switched mode power supply – Principle and application of induction and dielectric heating.

L : 45 TOTAL : 45PERIODS

TEXT BOOKS
1. G. K. Mithal, "Industrial Electronics", Khanna Publishers, Delhi, 2000.
2. M. H. Rashid, "Power Electronics Circuits, Devices and Application", 3rd Edition, PHI, 2004.
3. Dr.P.S.Bimbhra, "Power Electronics", 3rd Edition, Khanna Publishers, 2009.

REFERENCES
1. Ned Mohan, Tore M. Undeland, "Power Electronics: Converters, Applications, and Design" John Wiley & Sons, 2007.
2. G. M. Chute and R. D. Chute, "Electronics in Industry", McGraw Hill Ltd, Tokyo, 1995.
3. F. D. Petruzulla, "Industrial Electronics", McGraw Hill, Singapore, 1996.

BEI002   **INDUSTRIAL DATA NETWORKS**   **L T P C**
                                                                          3 0 0 3

OBJECTIVES:
- To understand basic data networks
- To learn the basic of inter networking
- To have adequate knowledge in various communication protocol.
- To study industrial data communication.

UNIT I   DATA NETWORK FUNDAMENTALS   9
Network hierarchy and switching – Open System Interconnection model of ISO– TCP/IP- Data link control protocol: HDLC .Medium access control techniques: Token ring, CSMA/CD.

UNIT II   INTER NETWORKING   9
Basic principles-Hubs-Bridges – Routers –Routing in switched networks- Gateways –Switching-Virtual LANs-LAN: ETHERNET –Wireless LAN-ARCNET

UNIT III   HART AND FIELDBUS   9
Introduction- Evolution of signal standard – HART communication protocol – Communication modes – HART networks – HART commands – HART applications. Fieldbus: Introduction – General Fieldbus architecture – Basic requirements of Field bus standard – Fieldbus topology – Interoperability – Interchangeability – Introduction to OLE for Process Control (OPC).

UNIT IV   MODBUS and PROFIBUS PA/DP/FMS AND FF   9
MODBUS protocol structure – function codes – troubleshooting Profibus: Introduction – profibus protocol stack – profibus communication model – communication objects – system operation – troubleshooting – review of foundation field bus.

UNIT V   INDUSTRIAL ETHERNET AND WIRELESS COMMUNICATION   9
Industrial Ethernet : Introduction – 10Mbps Ethernet, 100Mbps Ethernet. Radio and wireless communication : Introduction – components of radio link – the radio spectrum and frequency allocation – radio modems.

                                                            L : 45 TOTAL : 45 PERIODS

TEXT BOOKS
1. Steve Mackay, Edwin Wright, Deon Reynders, John Park, "Practical Industrial Data networks Design, Installation and Troubleshooting", 1st Edition, Newnes publication, Elsevier 2004.
2. Behrouz A. Forouzan "Data Communications and Networking", Tata McGraw- Hill, 2006.

REFERENCES
1. Theodore S.Rappaport, "Wireless communication Principles & Practice", 2nd Edition, Prentice Hall of India, 2001.
2. Willam Stallings, "Wireless Communication & Networks" 2nd Edition, Prentice Hall of   India 2005.
3. Andrew S. Tanenbaum, "Computer Networks", 4th Edition, PHI/Pearson Education   2002.

BEI003   METROLOGY   L T P C
**   3 0 0 3**
OBJECTIVE:
- To uncovered the knowledge of mechanical gears, gauges and different techniques for LASER measurement and operation of CNC machine.

UNIT I   BASIC CONCEPTS OF MEASUREMENTS   9
Need for measurement - Precision and Accuracy - Reliability - Errors in Measurements – Types – Causes.

UNIT II   LINEAR AND ANGULAR MEASUREMENTS   9
Measurement of Engineering Components: Comparators (Mechanical, Optical, Electrical) - Slip Gauges - Limit Gauges -Auto Collimator - Angle Decker - Alignment Telescope - Sine Bar - Bevel Protractor.

UNIT III   FORM MEASUREMENTS   9
Measurement of: Screw Thread - Gears - Radius - Surface Finish – Straightness - Flatness – Roundness.

UNIT IV   LASER METROLOGY   9
Precision instrument based on Laser: Use of Lasers - Principle - Laser Interferometer - Application in Linear and Angular measurements - Testing of machine tools using Laser Interferometer.

UNIT V   ADVANCES IN METROLOGY   9
Co-ordinate Measuring Machine (CMM) - Constructional features - Types - Applications of CMM – CNC applications - Computer Aided Inspection (CAI) - Machine Vision - Applications in Metrology.

**   L : 45 TOTAL : 45 PERIODS**
TEXT BOOK
1. R.K. Jain, "Engineering Metrology", Khanna publishers, 1994.

REFERENCES
1. I.C. Gupta, "A Text book of Engineering Metrology", Dhanpat Rai & sons, 1996.
2. G.N. Galyer and C.R. Shotbolt, "Metrology for Engineers", ELBS Edition, 1990.
3. Thomas "Engineering Metrology", Butthinson & co, 1984.

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Curriculum & Syllabus for B.E. (EIE)   **Regulations-2011**

BEI004   **MECHATRONICS**   **L T P C**

                                              3 0 0 3

OBJECTIVES:
- To study about basic definitions and introduction of Mechatronics.
- To study about different Sensors and Transducers in Mechatronic Applications.
- To study about different types of Actuation Systems.
- To study about different Controlling Techniques in Control Systems and PLC Programming.
- To study about recent advances in Industries.

UNIT I   INTRODUCTION   **7**

Mechatronics – definition and key issues – evolution – basic elements – Mechatronics approach to modern engineering design.

UNIT II   SENSORS AND TRANSDUCERS   **11**

Types – Displacement: Strain Gauge, Potentiometer, Capacitive, LVDT(Signal Conditioning Circuit for all types)–Position: Potentiometer, Optical Encoders – Proximity: Incremental Optical Encoder, Eddy Current, Pneumatic Proximity Sensor, Proximity Switches – Velocity: Optical Encoder, Variable reluctance Tachogenerator, AC Tachogenerator –Data Presentation and display Systems : DVM, Direct reading recorder, Printers, LED, LCD, Alarm Indicators.

UNIT III   ACTUATION SYSTEMS   **9**

Mechanical Actuation Systems: Types of Motion, Kinematic Chains, Cams, Gear trains, Belt & Chain drives, Bearings – Electrical Actuation Systems: Relay, SCR, BJT, Permanent Magnet DC Motor, H-Circuit, Brushless DC Motor, Single phase Squirrel Cage AC Induction Motor, Permanent Magnet Stepper Motor – Pneumatic and Hydraulic Actuation Systems : Pneumatic and Hydraulic Power Supplies, Directional Control Valves, Pressure Control Valves, Linear Actuator, Process Control Valves, Rotary Actuators.

UNIT IV   CONTROL SYSTEMS   **9**

Closed Loop Controllers: Two Step Mode, Proportional Control, Derivative Control, Integral Control, PID Controller – Programmable Logic Controllers: Basic Structure, Programming, Logic Functions, Latching, Sequencing, Timers, Counters.

UNIT V   RECENT ADVANCES   **9**

Temperature measurement system and Domestic Washing Machine using Microcontroller – Pick and Place Robot –Car Park barriers – Automatic Digital Camera – Car Engine Management System – Bar code Reader – Medical Mechatronics with MRI.

                                       L : 45 TOTAL : 45 PERIODS

TEXT BOOKS
1. Bolton, W., Macaronis: "Electronic Control systems in Mechanical and Electrical Engineering", Longman, 1995.
2. Dradly, D.A. Dawson., D, Burd, N.C., and Loader, A.J., "Mechatronics: Electronics in products and processes", Chapman & Hall, 1993.

REFERENCES
1. Galip Ulsoy, A., and Devires, W.R. "HMT Mechatronics", Tata McGraw Hill, New Delhi, 1968.
2. Galip Ulsoy, A., and Devires, W.R. "Microcomputer Applications in Manufacturing" Johnwiley, USA, 1989.
3. James Harter, "Electromechanics Principles, concepts and devices", Prentice Hall, New Jersey, 1995.

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Curriculum & Syllabus for B.E. (EIE)   **Regulations-2011**

BEI005   **MICRO ELECTRO MECHANICAL SYSTEMS**   **L T P C**
                    (Common to EIE & ECE)   **3 0 0 3**

OBJECTIVES:
- To integrate the knowledge of semiconductors and solid mechanics to fabricate MEMS devices.
- To understand the basics of Microfabrication techniques.
- To identify and understand the various sensors, actuators and different materials used for MEMS
- To study the applications of MEMS

UNIT I   OVERVIEW OF MEMS   9
History of MEMS, MEMS and Microsystems, Review of Electrical and Mechanical concepts in MEMS, Intrinsic Characteristic of MEMS, Scaling laws in Miniaturization. Materials for MEMS and Microsystems.

UNIT II   MICRO FABRICATIONS AND MICROMACHINING   9
Microsystem Design and Fabrication, Microsystem fabrication processes-Photolithography, Ion Implantation, Diffusion, Oxidation, Chemical and Physical Vapor deposition, Deposition by Epitaxy, Etching. Bulk Micro manufacturing, Basic surface micromachining processes, LIGA process.

UNIT III   MICROSENSORS   9
Resonant sensor, Vibratory gyroscope, Capacitive and Piezo Resistive Pressure sensors, Piezo Resistive accelerometer, Acoustic devices and SQUIDs

UNIT IV   MICROACTUATORS   9
Thermal Actuators - Thermal Sensing and Actuation, Thermal expansion, Thermocouples, Magnetic Actuators – Micromagnetic components, Piezoelectric and resistive actuators

UNIT V   APPLICATIONS   9
MEMS applications in Automobile, Military, Medical, Consumer, Industry and Space domains

L : 45 TOTAL : 45 PERIODS

TEXT BOOKS
1. Chang Liu, "Foundations of MEMS", Pearson Education India Limited, 2006.
2. Marc Madou, "Fundamentals of Microfabrication", CRC Press 1997.
3. Julian W. Gardner, Vijay K. Varadan, Osama O.Awadelkarim, "Micro Sensors, MEMS and Smart Devices", John Wiley & Son Ltd, 2002.

REFERENCES
1. Stephen D. Senturia, "Micro System Design", Kluwer Academic Publishers, 2001.
2. Minhang Bao, "Analysis and Design Principles of MEMS Devices", Elsevier, 2005.
3. Tai Ran Hsu, "MEMS and Microsystems Design and Manufacture", Tata McGraw - Hill, 2002.

BEI006   **VLSI SYSTEM DESIGN**   **L T P C**
                                                                                                        3 0 0 3

OBJECTIVES:

- To introduce MOS theory / Manufacturing Technology.
- To study inverter / counter logic / stick / machine diagram / sequential circuits.
- To study adders / memory / arithmetic circuits.
- To introduce FPGA architecture / principles / system design.
- To get familiarised with VHDL programming behavioral/Structural/concurrent/ process.

UNIT I   BASIC MOS TRANSISTOR   9
Enhancement mode and Depletion mode – Fabrication (NMOS, PMOS, CMOS, BiCMOS) Technology – NMOS transistor current equation – Second order effects – MOS Transistor Model.

UNIT II   NMOS AND CMOS INVERTER AND GATES   9
NMOS and CMOS inverter – Determination of pull up / pull down ratios – Stick diagram – lambda based rules – Super buffers –Pass transistor logic, static and dynamic CMOS logic.

UNIT III   SUB-SYSTEM DESIGN AND LAYOUT   9
Structured design of combinational circuits –parity generator-bus arbitration logic-multiplexers-gray to binary code converter– Tally circuits – NAND-NAND, NOR-NOR and AOI logic – EXOR structure – Multiplexer structures – Barrel shifter, high speed adder   (Ripple Carry Adder, Carry Select Adder, Carry Skip Adder, Carry Look ahead Adder) and multiplier circuits (Array multiplier, Dadda Multiplier, Wallace tree multiplier).

UNIT IV   DESIGN OF COMBINATIONAL ELEMENTS AND REGULAR ARRAY
                  LOGIC   9
NMOS PLA (NAND-NAND,NOR-NOR) – Programmable Logic Devices (FPLA, PROM, PAL, Dynamic Logic array) - Finite State Machine PLA – Introduction to FPGA, CPLD.

UNIT V   VHDL PROGRAMMING   9
VHDL synthesis-Modeling hardware in VHDL – Types – Operators – Packages – Sequential circuit – Sub-programs – Test benches. (Examples: adders, counters, flipflops, FSM, Multiplexers / Demultiplexers).

                                                                                    L : 45 TOTAL : 45 PERIODS

TEXT BOOKS
1. D.A.Pucknell, K.Eshraghian, "Basic VLSI Design", 3rd Edition, Prentice Hall of India, New Delhi, 2003.
2. Rabey, J.M., "Digital Integrated Circuits A Design Perspective", Prentice Hall, 1955.
3. Bhasker.J., "VHDL Primer", Prentice Hall, 1995.

REFERENCES
1. Eugene D.Fabricius, "Introduction to VLSI Design", Tata McGraw Hill, 1990.
2. N.H.Weste, "Principles of CMOS VLSI Design", Pearson Education, India, 2002.
3. Zainalatsedin Navabi, "VHDL Analysis and Modelling of Digital Systems", 2nd Edition, Tata McGraw Hill, 1998.
4. Douglas Perry, "VHDL Programming by example", 3rd Edition, Tata McGraw Hill, 2003.

BEI007   DIGITAL CONTROL SYSTEM   L T P C
                                                            3 0 0 3

OBJECTIVES:

- To study the importance of sample data control system.
- To give adequate knowledge about signal processing in digital control.
- To study the importance of modeling of discrete systems and stability analysis of discrete data system.
- To study the importance of state space representation for discrete data system.
- To introduce the design concept for digital controllers.

UNIT I   COMPUTER CONTROLLED SYSTEM   **9**
Configuration of the basic digital control scheme – general sampled data system variables – signal classifications – why use digital control system – Advantages – disadvantages – examples of discrete data and digital control systems.

UNIT II   SIGNAL PROCESSING IN DIGITAL CONTROL   **9**
Sampling process – Frequency domain analysis – ideal samples – Shanon's sampling theorem – generation and solution of process – linear difference equations – data reconstruction process – frequency domain characteristics.

UNIT III   DISCRETE SYSTEM MODELLING   **9**
Determination of the z transform – mapping between s and z domains - z transform of system equations – open loop Hybrid sampled Data Control Systems – open loop discrete Input Data Control System – closed loop sampled data control system – modified z transform method – response between sampling instants – stability on the z - plane and jury's stability test – steady state error analysis for stable systems.

UNIT IV   STATE VARIABLE ANALYSIS OF DIGITAL CONTROL SYSTEMS   **9**
State descriptions of digital processors – conversion of state variable models to transfer functions – conversion of transfer functions to canonical state variable models – first comparison form – second companion form – Jordon Canonical form – state description of sampled continuous time plants – solution of state difference equations – closed form solution – state transition matrix – Caley Hamilton Technique – concept of Controllability and absorbability – loss of controllability and observability due to sampling.

UNIT V   DIGITAL CONTROL   **9**
Digital PI, PD and PID Controller – Position and velocity forms – state regulator design – design of state observers – dead beat control by state feed back and dead beat observers.

                                                L : 45 TOTAL : 45 PERIODS

TEXT BOOKS
1. C.M. Houpis, G.B. Lamount, "Digital Control Systems-Theory, Hardware, Software", International Student Edition, McGraw Hill Book Co., 1985.
2. M.Gopal, "Digital Control and State Variables Methods", 2nd Edition, Tata McGraw HILL, 2003.

REFERENCES
1. B.C. Kuo, "Digital control systems", 2nd Edition, Oxford University press, 1992.
2. P.B. Deshpande and R.H. Ash, "Computer Process Control", ISA Publication, USA, 1995.

BIT005   **VISUAL PROGRAMMING**   **L T P C**
                                                                             3 0 0 3

OBJECTIVES:
- To study the concepts of visual programming using VC++.
- To understand the ActiveX controls.
- To learn about window programming, dialog and menu controls.

UNIT I   VISUAL PROGRAMMING FUNDAMENTALS   **9**
Windows Programming Fundamentals – MFC – Windows – Graphics – Drawing in a window -
Working with Menus – Mouse and keyboard – Bitmaps – Palettes – Device-Independent Bitmaps.

UNIT II   DIALOGS AND CONTROLS   **9**
Working with Dialogs and Controls – Modal and Modeless Dialog – Property – Data I/O – Sound –
Timer – Spin buttons.

UNIT III ADVANCED WINDOW PROGRAMMING   **9**
Memory management – SDI – MDI – MFC for Advanced windows user Interface – status bar and
Toolbars – Tree view – List view – Threads.

UNIT IV RESOURCE MANAGEMENT   **9**
ODBC – MFC Database classes – DAO - DLLs – Working with Images and Videos.

UNIT V   APPLICATION DOMAINS   **9**
File Handling - File System Controls - File System Objects - COM/OLE Fundamentals – ActiveX
control – ATL – Internet Programming.
                                                              L: 45 TOTAL: 45 PERIODS

TEXT BOOKS
1. Ivor Horton,"Ivor Horton's Beginning Visual C++ 2010 (Wrox Programmer to Programmer)",
   1st Edition, Wiley Publishing Inc., 2010.
2. Richard C.Leinecker and Tom Archer, "Visual C++ 6 Programming Bible", Wiley Dream
   Tech Press, 2006.

REFERENCES
1. Lars Klander, "Core Visual C++ 6.0", Pearson Education, 2000.
2. Nick Randolph, David Gardner, Michael Minutello and Chris Anderson, "Professional Visual
   Studio 2010(Wrox Programmer to Programmer)", 1st Edition, Wiley Publishing Inc., 2010.

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Curriculum & Syllabus for B.E. (EIE)   Regulations-2011

BGE001   ORGANIZATIONAL BEHAVIOUR   **L T P C**
                                                                                  3 0 0 3

OBJECTIVES:
- To provide a basic knowledge of main ideas and key theories relating to organizational behaviour
- To develop an understanding of these and of related ideas and concepts.
- To develop an interest in, an appreciation of, and a positive attitude toward the many aspects of the subject matter of management.

UNITI   FOCUS AND PURPOSE   5

Definition, need and importance of organizational behaviour – Nature and scope –Framework – Organizational behaviour models

UNIT II   INDIVIDUAL BEHAVIOUR   12

Personality–types–Factors influencing personality–Theories–Learning–Types of learners–The learning process–Learning theories–Organizational behaviour modification. Misbehaviour –Types– Management Intervention. Emotions-Emotional Labour–Emotional Intelligence –Theories. Attitudes –Characteristics–Components –Formation–Measurement- Values. Perceptions–Importance–Factors influencing perception–Interpersonal perception- Impression Management. Motivation –importance– Types–Effectson workbehavior.

UNIT III   GROUP BEHAVIOUR   10

Organization structure–Formation–Groups in organizations –Influence–Group dynamics – Emergence of informal leadersand working norms–Group decision making techniques–Team building- Interpersonal relations–Communication–Control.

UNIT IV   LEADERSHIP AND POWER   8

Meaning–Importance–Leadershipstyles–Theories–Leaders VsManagers–Sources of power–Power centers–Power and Politics.

UNIT V   DYNAMICS OF ORGANIZATIONAL BEHAVIOUR   10

Organizational culture and climate –Factors affecting organizational climate–Importance. Job satisfaction–Determinants–Measurements –Influence on behavior. Organizational change– Importance– Stability Vs Change– Proactive Vs Reaction change–the change process – Resistance to change–Managing change.Stress–WorkStressors–Prevention and Management of stress– Balancing work and Life.Organizational development–Characteristics–objectives–.Organizational effectiveness

                                                                        TOTAL: 45 PERIODS

TEXT BOOKS
1. StephenP. Robins, "Organizational   Behavior", PHI Learning/Pearson Education, 11th Edition, 2008.
2. Fred Luthans, "Organizational Behavior", McGraw Hill, 11th Edition, 2001.

REFERENCES
1. Schermerhorn, Hunt and Osborn,"Organisational behavior", John Wiley, 9th Edition, 2008.
2. UdaiPareek, "Understanding Organisational Behaviour", 2nd Edition, Oxford Higher Education, 2004.
3. Mc Shane & Von Glinov, "Organisational Behaviour", 4th Edition, TataMcGraw Hill, 2007.
4. Hellrigal, Slocum and Woodman, "Organisational Behavior, Cengage Learning", 11th Edition, 2007.
5. Ivancevich, Konopaske & Maheson, "Organizational Behaviour & Management", 7th edition, Tata McGraw Hill, 2008.

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Curriculum & Syllabus for B.E. (EIE)   Regulations-2011

BEI701   EMBEDDED SYSTEMS AND PROGRAMMING   L T P C
                                                                                          3 1 0 4

OBJECTIVES
- To describe the general principles of the microprocessor architecture
- To describe the general process of embedded system development and important embedded system terminologies
- To outline Systems Software Development, device driver development and the operating system concepts.
- To distinguish real time tasks and scheduling concepts.
- To create program for embedded systems.

UNIT I   INTRODUCTION TO MICROPROCESSOR ARCHITECTURE   12
Introduction-Instruction Word Formats-Representation of Instructions and Data-Addressing Techniques-Direct addressing-Immediate addressing-Relative addressing-Indirect addressing-Indexed addressing-Branch and Jump Instructions-Flags –Condition Codes-Status Registers-Subroutine Calls-Interrupts-Storage Hierarchies-Virtual memory-Cache Memory-Pipelined Computers-RISC and CISC Architecture

UNIT II   INTRODUCTION TO EMBEDDED SYSTEM   12
Model of an Embedded System-Microprocessor Vs Microcontroller-Figures of Merit for an Embedded System-Classification of Microcontroller unit: 4/8/16/32Bits-Current Trends-The Hardware Point of View: Microcontroller unit - A popular 8-bit Microcontroller unit - Memory for Embedded System-Low Power Design-Pullup and Pull down resistors-Examples of embedded system: Mobile phone, Automotive electronics, Biomedical applications

UNIT III   SOFTWARE DESIGN ASPECTS   12
Software Development tools: Embedded Program Development-Downloading the Hex File to the Non –Volatile Memory-Hardware Simulator-Operating System Concepts: Embedded Operating System-Network operating System - Layers of an Operating System-Functions Performed by an operating system - Some terms Associated With Operating System and Computer Usage-The Kernel-Tasks/Process-Scheduling Algorithms-Threads-Interrupt Handling-Inter Process Communication - Task Synchronization-Semaphores-Priority Inversion

UNIT IV   REAL TIME OPERATING SYSTEM   12
Real time Tasks-Real time systems-Types of Real time Tasks-Real time Operating Systems-Real time Scheduling Algorithms-Rate Monotonic Algorithm-The Earliest Deadline First Algorithm-Qualities of a Good RTOS-Device Drivers-Codes/Pseudo Codes for OS Functions-A Survey of contemporary Real time Operating systems : PSOS, VRTX, QNX-Benchmarking Real time systems – Basics

UNIT V   PROGRAMMING IN EMBEDDED C   12
Getting the Most out of C: Integer Data Types-Mixing Data Types-Useful Typesets -Manipulating Bits in Memory-Manipulating Bits in I/O Ports-Accessing Memory Mapped I/O Devices-Structures - Variant Access-Mixing C and Assembly: Programming in Assembly-Register Usage Conventions-Typical Use of Addressing Options-Instruction Sequencing-Procedure Call and Return-Parameter Passing-Retrieving Parameters-Embedded C-PIC programming using MPLAB.
                                                                    L: 45 T:15, TOTAL: 60 PERIODS

TEXT BOOKS
1. Lyla B.Das, "Embedded Systems an Integrated Approach" Pearson Education, 2013.
2. Daniel W. Lewis, "Fundamentals of Embedded Software", Prentice Hall of India, 2006.

REFERENCES
1. Rajib Mall "Real-Time systems Theory and Practice" Pearson Education 2007.
2. Sriram. V.Iyer & Pankaj Gupta, "Embedded real time systems Programming", Tata Mc Graw Hill, 2004.
3. Thomas C.Bartee, "Computer Architecture and Logic Design", Tata McGraw-Hill, 2010.

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Curriculum & Syllabus for B.E. (EIE)   Regulations-2011

BEI702   **VIRTUAL INSTRUMENTATION**

                                                                                                    3 0 0 3

OBJECTIVES
- To comprehend the basic building blocks of virtual instrumentation
- To identify salient traits of a virtual instrument and incorporate these traits in their Projects.
- To acquire knowledge on how virtual instrumentation can be applied for Control and instrumentation.
- To analyze and document in the laboratory prototype measurement systems using DAQ interfaces.

UNIT I   VIRTUAL INSTRUMENTATION   9
Review of quantization in amplitude and time axis, Historical perspective, advantages, block diagram and architecture of a virtual instrument, graphical programming in data flow, comparison with conventional programming, Tools and other palettes, PC Based data acquisition, Basics of LabVIEW.

UNIT II   FUNDAMENTALS OF VIRTUAL INSTRUMENTATION   9
Concepts of graphical programming – Lab-view software – Concept of VIs and sub VIs – Display types, FOR and while loops – additional loop problem, local variables, global variables – Other structures – sequence, case, formula node, event structure, graphs and charts.

UNIT III   GRAPHICAL PROGRAMMING ENVIRONMENT IN VI   9
Arrays and clusters – Inter conversion of arrays and clusters, file input / output – file formats, file input/output functions, path functions, VI s to demonstrate File Write and Read,string handling – string functions, parsing of strings.

UNIT IV   INTERFACING INSTRUMENTS   9
Interfacing of external instruments to a PC – RS 232C, USB standards – IEEE 488 standard –HART Communication-Network Connection, Communication modes, Protocol layers– introduction to bus protocols of MOD bus and CAN bus.

UNIT V   ANALYSIS TOOLS AND SIMPLE APPLICATION IN VI   9
DAQ Analog and Digital cards for VI applications – Requirements – Design of digital voltmeters with transducer input, Design of ON/OFF controller for temperature control applications, Fourier transform, Power spectrum, Correlation– Windowing and filtering tools, PID controller.

                                                                                TOTAL: 45 PERIODS

TEXT BOOKS
1. Jovitha, Jerome, "Virtual Instrumentation and LABVIEW", PHI Learning, New Delhi, 1st Edition, 2010.
2. Sanjay Gupta and Joseph John: Virtual Instrumentation using LabVIEW: Principles and Practices, 2nd Edition, Tata McGraw-Hill, 2010.

REFERENCES
1. Ronald W. Larsen, "Lab VIEW for Engineers", Prentice Hall Limited, USA Jan 2010
2. Mathivanan, PC-based Instrumentation-Concepts and Practice PHI Learning Private Limited, Aug-2007.
3. Travis, Travis Jeffrey, "LabVIEW for Everyone", Pearson Education India, Sep-2009.

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Curriculum & Syllabus for B.E. (EIE)   **Regulations-2011**

BEI703   **LOGIC AND DISTRIBUTED CONTROL SYSTEM**   **L T P C**
                                                                                     3 1 0 4

OBJECTIVES
- To study the fundamentals of PLC.
- To understand the basic construction in PLC.
- To study the application of PLC.
- To understand the basic of DCS and Interfaces.

UNIT I   **PROGRAMMABLE LOGIC CONTROLLER**   **12**
Evolution of PLC's – Components of PLC – Advantages over relay logic – Architecture of PLC– Programming devices - Discrete and Analog I/O modules – Programming languages - Ladder diagram – Programming timers and counters – Design of PLC.

UNIT II   **INSTRUCTION IN PLC**   **12**
Instructions in PLC – Program control instructions, math instructions, Data manipulation instructions, sequencer instructions – Use of PC as PLC – PLC to PC interfacing – PLC to PLC interfacing.

UNIT III   **APPLICATIONS OF PLC**   **12**
PLC Installation Practices - Editing and Troubleshooting – Data acquisitions system - Application of PLC - Case study of bottle filling system, traffic light control system –PLC in Cement industry - Programming concept in Allen Bradely PLC and Siemens PLC.

UNIT IV   **DISTRIBUTED CONTROL SYSTEM**   **12**
DCS –Evolution of Architectures – Comparison – Local control unit – Process interfacing issues - Communication facilities.

UNIT V   **INTERFACES IN DCS**   **12**
Operator interfaces - Low level and high level operator interfaces – Operator displays - Engineering interfaces – Low level and high level engineering interfaces – General purpose computers in DCS.

                                                      L: 45   T: 15   TOTAL: 60 PERIODS

TEXT BOOKS
1. Petruzella, "Programmable Logic Controller", McGraw Hill, 3rd Edition, 2009.
2. Michael P. Lukas, "Distributed Control System", Van Nostrand Reinhold Co., Canada, 2001.

REFERENCES
1. T. Hughes, "Programmable Logic Controllers", ISA press, 2007.
2. Krishna Kant, "Computer based Industrial Control", Prentice Hall, New Delhi, 2004.

WEB
    http://www.industry.usa.siemens.com/automation/us/en/process-control-system/pas-white-papers/Documents/dcsand-plc-cement.pdf

BMG601   **PRINCIPLES OF MANAGEMENT**   **L T P C**
                                                                      3 0 0 3

OBJECTIVES
- To get the skills needed to successfully manage an organization.
- To understand concepts of strategic and tactical organizational planning.
- Implement employee motivational approaches and conflict management skills.
- To describe common performance appraisal processes.
- To understand group and team management, management development, and employee training.
- Describe concepts of controlling and control systems.

UNIT I   FOUNDATIONS   9
Historical developments –approaches to management– Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Types of Business Organization ,Meaning ,features merits and demerits.

UNIT II   MANAGERS AND ENVIRONMENT   9
Social responsibility–Planning – Objectives – Setting Objectives – Process of Managing through Objectives – Strategies- Policies and Planning Premises- Forecasting – Decision-making.

UNIT III   FUNCTIONAL AREA OF ORGANISATION   9
Formal and informal organization – Organization Chart – Structure and Process – Departmentation by different strategies – Line and Staff authority – Benefits and Limitations – De-Centralization and Delegation of Authority – Staffing – Selection Process - Techniques – HRD – Managerial Effectiveness.

UNIT IV   MOTIVATION AND DIRECTIONS   9
Objectives– Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques – Job Enrichment – Communication.

UNIT V   CONTROLLING STRATEGIES   9
System and process of Controlling – Requirements for effective control – The Budget as Control Technique – Information Technology– Computers in handling the information – Productivity – Problems and Management – Control of Overall Performance – Direct and Preventive Control – Reporting – The Global Environment – Globalization and Liberalization – International Management and Global theory of Management.

                                                                TOTAL: 45 PERIODS

TEXT BOOKS
1. Hellriegel, Slocum & Jackson, "Management – A Competency Based Approach", Thomson South Western, 10th Edition, 2007.
2. Harold Koontz, Heinz Weihrich and mark V Cannice, "Management – A global & Entrepreneurial Perspective", Tata Mcgraw Hill, 12th Edition, 2007.
3. Andrew J. Dubrin, "Essentials of Management", Thomson Southwestern, 7th Edition, 2007.

REFERENCES
1. Stephen P. Robbins and Mary Coulter, "Management', Prentice Hall of India", 8th Edition, 2012.
2. Charles W.L Hill, Steven L McShane, "Principles of Management", Mcgraw Hill Education, Special Indian Edition, 2007.
3. Vijayaraghavan G.K & Sivakumar M. "Principles of Management", Lakshmi Publications, 1st Edition, 2011.
4. Ramachandran. S. "Principles of Management", Air Walk Publications, 1st Edition, 2007.

BEI731   **LOGIC AND DISTRIBUTED CONTROL SYSTEM LABORATORY**   **L T P C**
                                                                                                0 0 3 2

OBJECTIVES

- To apply the relay concept and PLC programming.
- To develop a ladder program for real time process.
- To develop the controller configuration in DCS.

LIST OF EXPERIMENTS

1. Design of Electronic On/Off controller with relay concept

2. Implementation of On Off controller using ELVIS

3. Micro-processor based temperature control system

4. Batch process control by Programmable Logic Controller

5. PLC controlled level process

6. Reaction vessel control using Programmable Logic Controller

7. Traffic light control Using Programmable Logic Controller

8. Bottle filling system controlled by Programmable Logic Controller

9. Computer controlled Closed loop response of Temperature process

10. Computer controlled Closed loop response of pressure process

11. Implementation of Controller for Pressure and Temperature process in Distributed Control system

12. Automation of the Cement Plant and Beverage Plant using Distributed Control system

TOTAL: 45 PERIODS

BEI732   **EMBEDDED SYSTEMS AND VIRTUAL INSTRUMENTATION**   **L T P C**
                                    LABORATORY   **0 0 3 2**

OBJECTIVES
- To learn Interfacing concepts, using PIC
- To learn combinational circuits using FPGA
- To acquire basic knowledge in VI building blocks

EMBEDDED SYSTEM EXPERIMENTS

1. Study of PIC development board
2. Interfacing keyboard, LCD, seven segment LED using PIC.
3. Design of combinational circuits in FPGA.
   - Encoder, decoder, adder, subtractor, multiplexer, demultiplexer, code converters
4. Design and implementation of traffic light controller using FPGA.
5. Control scheme for a Temperature Process using PIC.
6. Stepper motor interfacing.

VI EXPERIMENTS

1. Creating Virtual Instrumentation for simple applications
2. Programming exercises for Loops and Charts
3. Programming exercises for Clusters and Graphs.
4. Programming exercises on Case and Sequence Structures,
5. Programming exercise on File Input / Output.
6. Developing voltmeter using DAQ cards.
7. Developing signal generator using DAQ cards.
8. Real time temperature control using Virtual Instrumentation.

TOTAL: 45 PERIODS

BEI733   COMPREHENSION   **L T P C**
                                                                         0 0 3 1

OBJECTIVE
- To provide opportunity for the student to apply the knowledge acquired during the academic programme to real – life problems that he/she may have to face in future as an engineer.

Two periods per week shall be allotted in the time table for the activity and this time shall be utilized by the student to receive guidance from the members of faculty on solving real-life problems, practice solving these problems and on group discussions, seminar presentations, library reading as assigned by the faculty member in-charge. The continuous assessment and end semester evaluation may be carried out as specified in the guidelines to be issued from time to time, for which.

1. Two written tests of objective type question from the courses up to 6th semester may be conducted.

2. Seminars on latest topics may be conducted

3. Oral Exams on G.K, Technical knowledge, reasoning, may be conducted

4. Group discussions may be conducted

TOTAL: 45 PERIODS

BEI021   FIBRE OPTICS AND LASER INSTRUMENTS   **L T P C**
3 0 0 3

OBJECTIVES
- To describe the basic concepts of optical fibres and their properties.
- To illustrate principles of optical fibres in Industrial applications.
- To understand Industrial application and Medical applications in Lasers.

UNIT I   OPTICAL FIBRES AND THEIR PROPERTIES   9
Principles of light propagation through a fibre - Different types of fibres and their properties, fibre characteristics - Absorption losses - Scattering losses - Dispersion - Connectors and splicers – Fibre termination - Optical sources – Optical detectors.

UNIT II   INDUSTRIAL APPLICATION OF OPTICAL FIBRES   9
Fibre optic sensors – Fibre optic instrumentation system – Different types of modulators – Interferometric method of measurement of length – Moire fringes – Measurement of pressure, temperature, current, voltage, liquid level and strain.

UNIT III   LASER FUNDAMENTALS   9
Fundamental characteristics of lasers – Three level and four level lasers – Properties of laser – Laser modes – Resonator configuration – Q-switching and mode locking – Cavity damping – Types of lasers – Gas lasers, solid lasers, liquid lasers, semiconductor lasers.

UNIT IV   INDUSTRIAL APPLICATION OF LASERS   9
Laser for measurement of distance, length, velocity, acceleration, current, voltage and Atmospheric effect – Material processing – Laser heating, welding, melting and trimming of material – Removal and vaporization.

UNIT V   HOLOGRAM AND MEDICAL APPLICATIONS   9
Holography – Basic principle - Methods – Holographic interferometry and application, Holography for non-destructive testing – Holographic components – Medical applications of lasers, laser and tissue interactive – Laser instruments for surgery, removal of tumors of vocal cards, brain surgery, plastic surgery, gynaecology and oncology.

TOTAL: 45 PERIODS

TEXT BOOKS
1. J.M. Senior, "Optical Fibre Communication – Principles and Practice", Prentice Hall of India, 2009**.**
2. J. Wilson and J.F.B. Hawkes, "Introduction to Opto Electronics", Prentice Hall of India, 2001.

REFERENCES
1. G. Keiser, "Optical Fibre Communication", McGraw Hill, 2008.
2. John F. Read, "Industrial Applications of Lasers", Academic Press, 1978.
3. Monte Ross, "Laser Applications", McGraw Hill, 1968.

BEI022   IMAGE PROCESSING   **L T P C**
                                                                                 3 0 0 3
OBJECTIVES
- To describe the fundamentals of image processing.
- To explain the various image enhancement techniques.
- To explain various image compression standards.
- To develop applications of image processing.

UNIT I   FUNDAMENTALS OF IMAGE PROCESSING   9
Introduction – Steps in Image Processing Systems – Image Acquisition – Sampling and Quantization – Pixel Relationships – Colour Fundamentals and Models, File Formats, Image operations – Arithmetic, Geometric and Morphological.

UNIT II   IMAGE ENHANCEMENT   9
Spatial Domain – Gray level Transformations Histogram Processing Spatial Filtering – Smoothing and Sharpening – Frequency Domain: Filtering in Frequency Domain – DFT – FFT – DCT – Smoothing and Sharpening filters – Homomorphic Filtering.

UNIT III   IMAGE SEGMENTATION AND FEATURE ANALYSIS   9
Detection of Discontinuities – Edge Operators – Edge Linking and Boundary Detection – Thresholding – Region Based Segmentation – Morphological Water Sheds – Motion Segmentation – Feature Analysis and Extraction.

UNIT IV   MULTI RESOLUTION ANALYSIS AND COMPRESSIONS   9
Multi Resolution Analysis – Image Pyramids – Multi resolution expansion – Wavelet Transforms – Image Compression – Fundamentals – Models – Elements of Information Theory – Error Free Compression – Lossy Compression – Compression Standards.

UNIT V   REPRESENTATION, DESCRIPTION AND APPLICATION   9
Representation schemes- Boundary descriptors- Regional descriptors - Relational Descriptors Image Fusion – Steganography – Digital Compositing – Mosaic.

                                                                 TOTAL: 45 PERIODS
TEXT BOOKS

1. Rafael C.Gonzalez and Richard E.Woods, "Digital Image Processing", 2nd Edition, Pearson Education, 2007.
2. Anil K.Jain, "Fundamentals of Digital Image Processing", Pearson Education, 2003.
   Ron Patton, Software testing, 2nd Edition, Pearson education, 2007.

REFERENCES

1. Milan Sonka, Vaclav Hlavac and Roger Boyle, "Image Processing, Analysis and Machine Vision", 2nd Edition, Thomson Learning, 2001.
2. Alan C Gillies, "Software Quality Theory and Management", Cengage Learning, 2nd Edition, 2003.

BEI023   APPLIED SOFT COMPUTING   L T P C
                                                                          3 0 0 3
OBJECTIVES
- To familiarize with Soft Computing concepts.
- To describe the basic concepts of Artificial Neural Networks.
- To understand the fundamental concepts of Fuzzy Logic System.
- To introduce the concepts of genetic algorithm.
- To study about the applications of Artificial Neural Network, Fuzzy Logic system and Genetic Algorithm.

UNIT I   INTRODUCTION TO SOFT COMPUTING   9
Evolution of Computing -From Conventional AI to Computational Intelligence -Architecture for intelligent control - rule-based system - Knowledge representation - Expert system.

UNIT II   ARTIFICIAL NEURAL NETWORKS   9
Fundamentals of Artificial Neural Networks- Basic mathematical model and McCulloch-Pitts neuron model – single layer perceptron- Feed-forward Multilayer Perceptron -Supervised and unsupervised learning approaches- Neural Network based controller.

UNIT III   FUZZY LOGIC SYSTEM   9
Introduction to crisp sets and fuzzy sets -Operations on Fuzzy Sets - Membership Functions- fuzzy IF THEN rules-Fuzzy Inference Systems, Fuzzification and defuzzification- Fuzzy logic controller.

UNIT IV   GENETIC ALGORITHM   9
Gradient Search – Non-gradient search - Genetic algorithm- Genetic operators- Encoding- Binary, Octal, Hexadecimal-Decoding-Fitness Function- Selection-Roulette-wheel, Tournament, Rank and Steady-state- Crossover-Single-Point, Two Point, Multi-Point, Uniform- Cross Over Rate-Mutation.

UNIT V   APPLICATIONS   9
Neural network controller for inverted pendulum - Fuzzy logic controller for inverted pendulum - Home heating system- Introduction to Neuro-fuzzy systems – Case study: Optimization Algorithm-Tabu search and Ant-colony search techniques for solving optimization problems.

                                                          TOTAL: 45 PERIODS
TEXT BOOKS
1. J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro- Fuzzy and Soft Computing", Pearson Education, New Delhi, 2004.
2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill, 2005.

REFERENCES
1. Jacek M. Zurada, "Introduction to Artificial Neural Systems", Jaico Publishing Home, 2004.
2. Laurance Fausett, "Fundamentals of Neural Networks", Pearson Education, 2004.
3. John Yen and Reza Langari, "Fuzzy Logic – Intelligence, Control and Information", Pearson Education, New Delhi, 2004.
4. David Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", Pearson Education, 2007.

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Curriculum & Syllabus for B.E. (EIE) **Regulations-2011**

BEI024 **SENSOR NETWORKS** **L T P C**
                                                                    3 0 0 3

OBJECTIVES
- To understand the fundamental concepts of wireless and sensor networks.
- To develop simple wireless sensor network applications using actual motes and sensor devices.
- To understand and explain protocol design issues and protocol designs for wireless sensor networks.
- To set up and evaluate measurements of protocol performance in wireless sensor networks.

UNIT I **INTRODUCTION** **9**
Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks, Sensor Networks Application, Sensor node technology, Sensor Taxonomy, wireless network operating environment, Tracking multiple objects, sensor models.

UNIT II **SENSOR NODE HARDWARE AND NETWORK ARCHITECTURE** **9**
Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Design principles for WSN, service interface of WSN, Gateway.

UNIT III **COMMUNICATION PROTOCOLS** **9**
Physical layer, MAC Protocols- Fundamentals, S-MAC Protocol, IEEE 802.15.4 standard, Link layer protocol-Error control, framing, link management, Routing Protocols- Energy-Efficient Routing, Geographic Routing.

UNIT IV **DEPLOYMENT AND CONFIGURATION** **9**
Naming and Addressing-Assignment of MAC address, content based and geographic addressing, Localization and positioning- Single-hop and multihop localization, Coverage and deployment.

UNIT V **SENSOR SECURITY AND NETWORK TOOLS** **9**
Security architecture, Cell based WSNs, Privacy of local information, Security Protocols in Sensor Networks, Communication Security in Sensor Networks, Sensor Node Hardware – Berkeley Motes, Sensor network Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.

TOTAL: 45 PERIODS

TEXT BOOKS
1. Holger Karl & Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley, 2005.
2. Feng Zhao, Leonidas Guibas, "Wireless Sensor Network", Elsevier, 1st Edition, 2004 (ISBN: 13- 978-1-55860-914-3).

REFERENCES
1. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.
2. Mohammad Ilyas and Imad Mahgoub, "Handbook of Sensor Networks: Compact Wireless and Wired Sensing Systems", CRC Press, 2009.

BEI025   TESTING AND CALIBRATION OF INSTRUMENTS   L T P C
3 0 0 3

OBJECTIVES
- To define key terms related to calibration and interpret the meaning of each.
- To list the various methods used in a calibration procedure.
- To select the proper calibration procedure.
- To calibrate the different type of instruments and determine acceptability.

UNIT I   INTRODUCTION TO TESTING AND CALIBRATION   9
The Signal Flow of Electronic Instruments, The Instrument Block Diagram, Measurement Systems, Types of instrument, Traceability, Calibration Types, Calibration Requirements, Calibration Methodology, Instrument Specifications and Calibration Tests, Calibration Standard Requirements

UNIT II   TEST MEASUREMENT INSTRUMENTATION   9
Test Measurement Instrumentation – Components and Characteristics of an Ideal Test Measurement System, Differences between Test Measurement Instrumentation and Process Instrumentation, Smart Transducers ,Test Objective- Required Measurements, Accuracy Requirements, Frequency Response Requirements, Transducer Test Environment Limits, Transducer Connections and Space Limitations, Test Data Format, Test Data Analysis, Transducer Selection

UNIT III   TESTING OF INSTRUMENTS   9
Voltage-Voltmeter, Current - Ammeter and Resistance - Ohmmeter, Temperature - Thermocuple, Pressure - Primary pressure sensing elements-Diaphragm, Bourdon tube

UNIT IV   CALIBRATION REQUIREMENTS   9
Calibration procedure, calibration procedure content, calibration datasheet, P&IDs, loop diagrams, Instrument Specification Forms, Project Specifications, Manufacturer's Specifications, Calibration Intervals, Safety Considerations, Calibration Status Labels

UNIT V   CALIBRATION SERVICES   9
National Measurement Standard Laboratories,Commercial Calibration Services, In-House Calibration, Modern techniques, standards in different National Laboratories and Bureaus, calibration management and maintenance

TOTAL: 45 PERIODS

TEXT BOOKS
1. Mike Cable, "Calibration A technician's guide", ISA, 2005.
2. Vaisala Oyj, "Calibration Book"- Calibration book project team, 2006.

REFERENCES
1. Clyde F.Coombs Jr, "Electronic Instrument Handbook", 3rd Edition, 2008.
2. WIKA Handbook Pressure & Temperature Measurement Beamex, Ultimate calibration, 2nd Edition, 2013.

BEI026   NON-DESTRUCTIVE TESTING   L T P C
                                                                                3 0 0 3

OBJECTIVES
- To differentiate the Non destructive testing from destructive testing techniques.
- To understand the fundamentals and principles involved in the various Non destructive testing.
- To describe the procedures used to perform basic NDT techniques.
- To discuss the advantages and limitations of one method over other methods.
- To critically appraise the NDT techniques available and to select the most appropriate one for a given situation/application.

UNIT I   VISUAL INSPECTION AND LIQUID PENETRANT TESTING   9
Introduction: Comparison of Destructive and Non-Destructive Tests-Conditions for Effective Non-Destructive Testing
Visual Inspection:-Optical aids used for visual Inspection-Applications
Liquid Penetrant Testing: Physical Principles-Procedure for Penetrant Testing-Penetrant Testing Materials –Penetrant Testing Methods-Water washable and Post-Emulsifiable Method.

UNIT II   ULTRASONIC AND ACOUSTIC EMISSION TESTING   9
Ultrasonic Testing: Principle- Ultrasonic Transducers-Flaw detection equipment-Modes of display-Variables affecting Ultrasonic Test-Pulse echo, through transmission and Angle Beam Testing-Applications, Advantages and Limitations.
Acoustic Emission Testing: Principle – Instrumentation –Advantages, Limitations and applications-Acoustic Emission testing of metal pressure vessels-Fatigue crack detection in Aerospace structures.

UNIT III   MAGNETIC PARTICLE, EDDY CURRENT AND MAGNETIC FLUX
**   LEAKAGE TESTING   9**
Magnetic Particle Testing: Principle- magnetizing techniques- Procedure used for testing a component –Advantages, Limitations and applications
Eddy current Testing: Principles –Instrumentation for Eddy current testing – Inspection of ferromagnetic materials-Pulsed eddy current testing- Applications.
Magnetic Flux Leakage (MFL) Testing: Principle- Magnetizing and Demagnetizing methods – MFL sensors – Flaw detection and analysis in ferromagnetic specimen –advantages, Limitations and applications.

UNIT IV   THERMOGRAPHY AND RADIOGRAPHY TESTING   9
Thermography: Principle- Detectors and Equipments for active thrermography –heating sources – applications-Thermal imaging for condition monitoring of Industrial Components
Radiography: Principle- Electromagnetic radiation sources – Radiographic imaging equipments-various inspection techniques-Reading and interpretation of radiographs – safety in industrial radiography.

UNIT V   INDUSTRIAL APPLICATIONS OF NON-DESTRUCTIVE TESTING   9
Industrial Applications of Non Destructive Testing: Railways- Nuclear industry –chemical industry -aircraft and aerospace industries –automotive industries-Selection of NDT methods –Codes, standards, specifications and Procedures.

                                                            TOTAL: 45 PERIODS
TEXT BOOK

1. Baldev Raj, Jeyakumar, T., Thavasimuthu, M., "Practical Non Destructive Testing", Narosa Publishing House, New Delhi, 2002.

REFERENCES

1. Peter J. Shull "Non Destructive Evaluation: Theory, Techniques and Application", Marcel Dekker, Inc., New York, 2002.
2. Prasad J and C.G.K. Nair, "Non-Destructive Test and Evaluation of Materials", Tata McGraw-Hill Publishing Company Limited, New Delhi, 2008.
3. Charles J. Hellier, "Hand Book of Non-Destructive Evaluation", The McGraw-Hill Companies, New York, 2003.

BME014   **FUNDAMENTALS OF NANO TECHNOLOGY**   **L T P C**
                                                                                    3 0 0 3

OBJECTIVE
- To study the basics and important applications of nanotechnology.

UNIT I   INTRODUCTION   10
Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II   PREPARATION METHODS   10
Bottom-up Synthesis-Top-down Approach: Precipitation, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNITIII   PATTERNING AND LITHOGRAPHY FOR NANOSCALE DEVICES   5
Introduction to optical/UV electron beam and X-ray Lithography systems and processes, Wet etching, dry (Plasma /reactive ion) etching, Etch resists-dip pen lithography

UNIT IV   PREPARATION ENVIRONMENTS   10
Clean rooms: specifications and design, air and water purity, requirements for particular processes, Vibration free environments: Services and facilities required. Working practices, sample cleaning, Chemical purification, chemical and biological contamination, Safety issues, flammable and toxic hazards, biohazards.

UNIT V   CHARACTERIZATION TECHNIQUES   10
X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation

TOTAL: 45 PERIODS

TEXT BOOKS
1. A.S. Edelstein and R.C. Cammearata, eds., "Nanomaterials: Synthesis, Properties and Applications", Institute of Physics Publishing, Bristol and Philadelphia, 1996.
2. N John Dinardo, "Nanoscale Characterization of Surfaces & Interfaces", 2nd Edition, Weinheim Cambridge, Wiley-VCH, 2000.

REFERENCES
1. G Timp (Editor), "Nanotechnology", AIP press/Springer, 1999.
2. Akhlesh Lakhtakia (Editor), "The Hand Book of Nano Technology, Nanometer Structure-Theory, Modeling and Simulations", Prentice-Hall of India Private Limited, New Delhi, 2007.

BMA001   NUMERICAL METHODS WITH PROGRAMMING   L T P C
**   IN C FOR ENGINEERS   3 0 0 3**

OBJECTIVES

On the successful completion of this course, the students should be able to

- Solve algebraic and transcendental equations using numerical methods
- Interpolate the given data and find the extremum
- Perform integration when the function is given by means of tabular values
- Solve the ordinary and partial differential equations by various methods numerically

UNIT I   SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS   9

Solution of equation:- Iteration method – Newton Raphson method-Solution of system of linear equations by Gaussian elimination and Gauss-Jordon method ; Iterative methods-Gauss-Jacobi and Gauss-Seidel; Programming for Newton Raphson, Gaussian elimination and Gauss-Seidel methods in C.

UNIT II   INTERPOLATION   9

Newtons's forward and backward interpolation formulae-Gauss Forward and Backward difference formulae – Lagrange's interpolation formula –Newton's divided difference formula; Programming for Lagrange's interpolation formula and Newton's divided difference formula in C.

UNIT III   NUMERICAL INTEGRATION   9

Numerical integration by trapezoidal and Simpson's 1/3 and 3/8 rules–Romberg's method- Two and Three point Gaussian quadrature formulae – Double integrals using trapezoidal and Simpson's rules; Programming for trapezoidal and Simpson's rules in C.

UNIT IV   INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL
**   EQUATIONS   9**

Single step methods: Taylor series method for first and second order equations – Euler method for first order equation – Euler's modified and improved methods for first order equation – Fourth order Runge – Kutta method for solving first and second order equations.

UNIT V   BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL
**   DIFFERENTIAL EQUATIONS   9**

Finite difference solution of second order ordinary differential equation – Finite difference solution of one dimensional heat equation by explicit and implicit methods – One dimensional wave equation and two dimensional Laplace and Poisson equations.

TOTAL: 45 PERIODS

TEXT BOOKS
1. Veerarjan, T and Ramachandran, T. "Numerical methods with programming in 'C' " 2nd Edition, Tata   McGraw-Hill Publishing Company Limited, 2007.
2. Grewal, B.S. "Numerical methods in Engineering and Science with programming in C and C++", 9th Edition, Khanna Publishers, New Delhi, 2010.

REFERENCES
1. Chopra, S. C and Canale, R. P. "Numerical Methods for Engineers", 5th Edition, Tata McGraw - Hill, New Delhi, 2007.
2. Gerald, C. F. and Wheatley, P.O., "Applied Numerical Analysis", 6th Edition, Pearson Education Asia, New Delhi, 2006.

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BGE002   **INDUSTRIAL SAFETY ENGINEERING**   **L T P C**
                                                                                                                 3 0 0 3
OBJECTIVE
- To understand the basic concepts and Principles in the area Safety, health and hazards

UNIT I   ACCIDENT INVESTIGATION AND ANALYSIS   9
Concept of an Accident, reportable and non reportable accidents, reporting to statutory authorities. Principles of accident prevention-accident investigation and analysis-Unsafe act and unsafe condition-Domino sequence-cost of accidents-permanent total disabilities, Permanent partial disabilities, Temporary total disabilities-Calculation of frequency rate and severity rate of accidents.

UNIT II   ERGONOMICS AND HUMAN BEHAVIOUR   9
Introduction to ergonomics and its area of application in the work system. Anatomy, Posture and body mechanics-low back pain, risk factors for musculoskeletal disorders in the work place- behavioural aspects of posture-effectiveness. Individual differences, Factors contributing to personality, fitting the man to the job. Motivation- job satisfaction-Frustration and conflicts, reaction to frustration, emotion and frustration. Attitudes-determination of attitudes- changing attitudes.

UNIT III   HAZARDS AND THEIR CONTROL   9
Physical hazards-Noise, heat, vibration, ionizing and non ionizing radiations, and effects. Chemical hazards-dusts, fumes, mist, vapor, fog, gases, types, concentration, exposure Vs. dose, TLV. Mechanical hazards. Engineering control methods- use of personal protective equipment's.

UNIT IV   FIRE PREVENTION AND PROTECTION   9
Fire triangle-principles of fire extinguishing- various classes of fires- A, B, C, D types of fire extinguishers- Industrial fire protection systems. Sprinklers- Fire hydrants- Alarm and detection systems- other suppression systems- CO_2 system, foam system and DCP system.

UNIT V   SAFETY MANAGEMENT TECHNIQUES, EDUCATION AND TRAINING 9
Incident recall technique (IRT), disaster control, Job safety Analysis, Safety survey, safety inspection. Safety training programs, seminars, conferences, competitions- method of promoting safe practice-motivation- creating awareness, awards, celebrations, safety posters, safety displays, safety incentive scheme- domestic safety and training.

                                                                                        TOTAL: 45 PERIODS
TEXT BOOKS
1. Heinrich.H.W. "Industrial Accident Prevention" McGraw Hill Company, New York, 1980.
2. John V.Grimaldi and Rollin H. Simonds, "Safety Management" , All India Travelers Book Seller, New Delhi, 1989.
3. E.J.McCormick and M.S. Sanders "Human Factors in Engineering and Design", TMH New Delhi, 1982.
4. Hand Book of "Occupational Safety and Health", National Safety Council, Chicago, 1982.
5. Derek, James, "Fire Prevention Hand Book", Butter Worths and Company, London, 1986.

REFERENCES
1. Krishnan.N.V. "Safety Management in Industry" Jaico Publishing House, Bombay, 1997.
2. Lees, F. P. "Loss Prevention in Process Industries", Butter Worth publications, London, 2nd Edition, 1990.
3. Dan Peterson, "Techniques of Safety Management", McGraw Hill Company, Tokyo, 1981.
4. "Accident Prevention Manual for Industrial Operations", N.S.C. Chicago, 1982.
5. Hunter, Gomos, "Engineering Design for Safety", McGraw Hill Inc., 1992.
6. Encyclopedia of "Occupational Health and Safety" Vol I and II, Published by International Labour Office, Geneva 1985.
7. Gupta. R.S., "Hand Book of Fire Technology", Orient Longman, Bombay, 1977.

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Curriculum & Syllabus for B.E. (EIE)   **Regulations-2011**

BEI801   **POWER PLANT INSTRUMENTATION**   **L T P C**
3 0 0 3

OBJECTIVES
- To describe the basic concepts of instrumentation to control the boiler parameters.
- To apply the knowledge of power plant instrumentation to control the boiler parameters.
- To analyze the different types of devices used in power plants.
- To interpret the different types of controls and control loops.

UNIT I   OVERVIEW OF POWER GENERATION   9
Importance of instrumentation in power generation - Thermal power plants – Basic building blocks - P&I diagram –Overview of other methods of power generation – hydro, nuclear, solar and wind power– cogeneration.

UNIT II   MEASUREMENTS IN POWER PLANTS   9
Electrical measurements – current, voltage, power, frequency, power factor etc. – nonelectrical parameters – flow of feed water, fuel, air and steam with correction factor for temperature – steam pressure and steam temperature – drum level measurement – radiation detector – smoke density measurement – dust monitor.

UNIT III   ANALYZERS IN POWER PLANTS   9
Flue gas oxygen analyser – analysis of impurities in feed water and steam – dissolved oxygen analyser –fuel analyser –Combustibles Analyser- pollution monitoring instruments.

UNIT IV   CONTROL LOOPS IN BOILER AND TURBINE   9
Feed water control-Steam pressure control -Combustion control – air/fuel ratio control – furnace draft control – drum level control –super heater control –Intristic and electrical Safety- interlocks in boiler operation.
Turbine monitoring and control: speed, vibration, shell temperature monitoring.

UNIT V   NUCLEAR POWER PLANT INSTRUMENTATION   9
Piping and instrumentation diagram of different types of nuclear power plant -radiation detection instruments -process sensors for nuclear power plants -spectrum analyzers --nuclear reactor control systems and allied instrumentation.

TOTAL: 45 PERIODS

TEXT BOOKS
1. Sam G.Dukelow, "The Control of Boilers", Instrument Society of America Press, 2003.
2. K.Krishnaswamy, M.Ponni Bala, "Power Plant Instrumentation", PHI Learning Limited, 2011.
3. B.G.Liptak, "Instrument Engineers Hand Book", 4th Edition, CRC press, 2012.

REFERENCES
1. Elonka,S. M. and Kohal. A.L. "Standard Boiler Operations", McGraw-Hill, New Delhi, 2002.
2. P.K Nag, "Power Plant Engineering", Tata McGraw Hill, 2001.
3. R.K.Jain, "Mechanical and Industrial Measurements", Khanna Publishers, New Delhi, 2008.

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Curriculum & Syllabus for B.E. (EIE)   **Regulations-2011**

BEI802   BIOMEDICAL INSTRUMENTATION   L T P C
                     (Common to EIE, EEE)   **3 0 0 3**

OBJECTIVES
- To introduce the various sensing and measurement related to Biomedical instrumentation.
- To bring out the important and modern method of imaging equipments.
- To provide latest knowledge of medical assistance / technique and therapeutic equipments.

UNIT I   PHYSIOLOGY AND TRANSDUCERS   9
Cell and its structure - Resting and Action Potential - Propagation of action potential - Nervous system: Nerve cell - synapse - CNS- PNS-Electro physiology of heart and lungs- Introduction to biosensor and types.

UNIT II   ELECTRO-PHYSIOLOGICAL MEASUREMENT   9
General block diagram of Biomedical Instrumentation system – Electrodes: Micro, needle and surface electrodes – Amplifiers: Preamplifiers, differential amplifiers, chopper amplifiers – Isolation amplifier. ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms. Electrical safety in medical environment: shock hazards – leakage current-Instruments for checking safety parameters of biomedical equipments.

UNIT III   NON-ELECTRICAL PARAMETER MEASUREMENT   9
Measurement of blood pressure –blood flow- Cardiac output – Heart rate – phonocardiography - Pulmonary function measurements – spirometer – Photo Plethysmography, Body Plethysmography – pH of blood –measurement of blood pCO_2, pO_2, - Introduction to ESR, GSR measurements .

UNIT IV   MEDICAL IMAGING AND TELEMETRY   9
Radiographic and fluoroscopic techniques – Instrumentation in Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography – Different types of biotelemetry systems, telemedicine and patient monitoring.

UNIT V   ASSISTING AND THERAPEUTIC DEVICES   9
Pacemakers – Defibrillators – Ventilators – Nerve and muscle stimulators – Diathermy – Heart – Lung machine – Prosthetic devices – Dialysers – Lithotripsy.

                                                                        TOTAL: 45 PERIODS
TEXT BOOKS
1. R.S.Khandpur, "Hand Book of Bio-Medical Instrumentation", Tata McGraw Hill Publishing Company Limited, 2003.
2. Leslie Cromwell, Fred J.Weibell, Erich A.Pfeiffer, "Bio-Medical Instrumentation and Measurements", 2nd Edition, Pearson Education, PHI 2002.

REFERENCES
1. M.Arumugam, "Bio-Medical Instrumentation", Anuradha Agencies, 2003.
2. L.A. Geddes and L.E.Baker, "Principles of Applied Bio-Medical Instrumentation", John Wiley & Sons, 1989.
3. J.Webster,"Medical Instrumentation Application and Design", 4th Edition, Wiley, 2009.
4. C.Rajarao and S.K. Guha, "Principles of Medical Electronics and Bio-medical Instrumentation", Universities Press (India) Limited, Orient Longman Limited, 2000.

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Curriculum & Syllabus for B.E. (EIE)   **Regulations-2011**

BEI041   **PC BASED INSTRUMENTATION**   **L T P C**
                                                                                                      3 0 0 3

OBJECTIVES
- To recall different types of Sensors and actuators.
- To adequate knowledge in various Protocols.
- To understand various Data networks.

UNIT I   INTRODUCTION   9
Generalized Instrumentation system - Measurement systems- control system. Features of personal computers, PC_Based Instrumentation Systems- Data Acquisition systems- PC interfaces. Signal Conditioning and Op Amp circuits-Operational amplifiers, Amplifiers, Bridge circuits, Filters.

UNIT II   HARDWARE ORGANISATION OF IBM PC   9
Motherboard components-System resources- Interrupt Request lines, DMA Channels, I/O space, Utilization of System Resources, Peripheral control chips, Expansion buses and I/O ports, Peripherals.

UNIT III   PRINCIPLES OF DATA ACQUISITION AND INTERFACING   9
Sampling concepts, Data Acquisition Configurations, Expansion Buses-ISA, EISA, PCI. Parallel port, Plug-in Boards, Data Acquisition using GPIB-Over view of GPIB,GPIB Commands, GPIB programming.

UNIT IV   DATA ACQUISITION USING SERIAL INTERFACES   9
Microcontroller serial Interfaces- UART Interface, I^2C Bus, SPI Bus, Microwire.USB, IEEE 1394- features, Signal transmission, Protocol, data transfer modes.

UNIT V   NETWORKED DATA ACQUISITION   9
Network Data communication, local Area Networks-OSI Model, LAN Characteristics, TCP/IP, Wireless LAN.HART communication, PC based data - Acquisition systems - Industrial process measurements like flow, temperature, Pressure, and level PC based instruments development system.

TOTAL: 45 PERIODS

TEXT BOOK
1. Mathivanan .N. "PC based Instrumentation", PHI Learning Private Limited, 2011.

REFERENCES
1. S K Singh "Industrial Instrumentation and Control", Tata McGraw-Hill, 2012.
2. Krishna Kanth, "Computer Based Industrial Control", Prentice Hall, 2004.
3. Michael H. Tooley, "PC-based Instrumentation and Control", Newnes, 2003.
4. John Park, Steve Mackay, "Practical Data Acquisition for Instrumentation and Control System", Newnes, 2003.

BEI042   **AIRCRAFT INSTRUMENTATION**   **L T P C**
                                                                             3 0 0 3

OBJECTIVES
- To introduce the various system in the Aircraft.
- To provide the auxiliary system in the Aircraft system.
- To provide the instruments used in Aircraft.

UNIT I   AIRPLANE CONTROL SYSTEMS   9
Conventional Systems - fully powered flight controls - Power actuated systems – Modern control systems - Digital fly by wire systems - Auto pilot system active control Technology.

UNIT II   AIRCRAFT SYSTEMS   9
Hydraulic systems - Study of typical workable system - components - Pneumatic systems - Advantages - Working principles - Typical Air pressure system – Brake system - Typical Pneumatic power system - Components, Landing Gear systems – Classification.

UNIT III   ENGINE SYSTEMS   9
Fuel systems for Piston and jet engines - Components of multi engines. Lubricating systems for piston and jet engines - Starting and Ignition systems - Typical examples for piston and jet engines.

UNIT IV   AUXILIARY SYSTEM   9
Basic Air cycle systems - Vapour Cycle systems, Evaporative vapour cycle systems - Evaporative air cycle systems - Fire protection systems, Deicing and anti icing systems.

UNIT V   INSTRUMENTS   9
Flight Instruments and Navigation Instruments – Gyroscope - Accelerometers, Air speed Indicators – TAS, EAS- Mach Meters - Altimeters - Principles and operation - Study of various types of engine instruments - Tachometers - Temperature gauges - Pressure gauges - Operation and Principles.

TOTAL: 45 PERIODS

TEXT BOOKS

1. S.Nagabhashana, L.K.Sudha, "Aircraft Instrumentation and Systems", L.K. International Publishing Limited, 2010.
2. McKinley, J.L., and Bent, R.D., "Aircraft Maintenance & Repair", McGraw-Hill, 1993.

REFERENCES

1. Mckinley, J.L. and Bent, R.D., "Aircraft Power Plants", McGraw-Hill, 1993.
2. Pallet, E.H.J., "Aircraft Instruments & Principles", Pitman & Company, 1993.
3. Treager, S., "Gas Turbine Technology", McGraw-Hill, 1997.

BEI043   **ADVANCED PROCESS CONTROL**   **L T P C**

3 0 0 3

OBJECTIVES
- To describe the linear control theory and its applications in conventional control process.
- To analyze and categorize the process by discrete method.
- To develop advanced controller for real time process.

UNIT I   ELEMENTS OF COMPUTER PROCESS CONTROL   9
Review of Conventional Process Control: Introduction to Process Control - Process Dynamics and Mathematical Models-Types of Dynamic Processes - Basic Feedback Control - Stability of Conventional Control Systems - Problem Control Situations - Computer - Control Hardware and Software :Conventional Control versus Computer Control - Basic Concepts of Computers- Computer System Hardware Concepts - Computer System Software Concepts - Configurable Digital Systems and Networks - Single - Loop Computer Control   : The Present System - Switchover to Computer Control

UNIT II   DISCRETIZATION OF THE PROCESS   9
The Z Transformation: Z Transform of Various Functions - Properties of Z Transforms - The Inverse Z Transformation-Pulse Transfer Functions :Complex Series Representation of the Sampler - Development of the Pulse Transfer Function-Data Holds : Transfer Function of the Zero - Order Hold - Transfer Function of the First-Order Hold-Sampling Frequency Considerations - Selection of Optimum Sampling Period

UNIT III   ANALYSIS OF SAMPLED DATA SYSTEM   9
Open-loop response of sampled - data systems: Example of Open-Loop Response - Open-Loop Response of Sampled - Data Systems: Closed - Loop Pulse Transfer Functions - Example to Determine Closed - Loop Transient Response - Design of Sampled - Data Control Systems Deadbeat Algorithm - Dahlin Algorithm - Digital Equivalent to a Conventional Controller Treatment of Noisy Process Signals- Stability of Sampled - Data Control System: Schurr-Chonn Stability Criterion

UNIT IV   DESIGN OF ADVANCED CONTROL SCHEMES   9
Modified Z Transforms: Definitions and Evaluation of Modified Z Transforms - Application of Modified Z Transforms to Systems with Dead Time - Application of Modified Z Transforms to Determine Output Between Sampling Instants - Design and Application of Advanced Control Concepts: Process Modeling from Step - Test Data - Pulse Testing for Process Identification - Time Domain Process Identification - Algorithms for Processes with Dead Time : Smith Predictor Algorithm - Analytical Predictor Algorithm - Algorithm of Gautam and Mutharasan

UNIT V   ADVANCED CONTROL SCHEMES   9
Feed forward control: Introduction and Design Fundamentals - Cascade Control: Controller Design of Cascade Systems - An Industrial Application of Cascade - Control Technique - Use of Cascade Control - Multivariable Control Systems: The Interaction Measure - Interaction and Decoupling.

TOTAL: 45 PERIODS

TEXT BOOK
1. Pradeep B.Deshpande and Raymond H.Ash, "Elements of Computer Process Control with Advanced Control Applications", Prentice Hall 2004.

REFERENCES
1. Astrom, K. J. and B. Wittenmark, "Computer Controlled Systems", Prentice Hall, 2005.
2. Franklin, G. F. and J. D. Powell, Digital Control of Dynamic Systems, Addison-Wesley, 2007.
3. Benjamin C.Kuo, Digital Control Systems, Oxford University Press, 2010.

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Curriculum & Syllabus for B.E. (EIE)   Regulations-2011

BEI044   INDUSTRIAL AUTOMATION AND CONTROL   L T P C
3 0 0 3
OBJECTIVES
- To describe different process in Petrochemical, Iron & Steel Industries.
- To understand different controls in Chemical Reactors.
- To discuss Special application in Process Industries.

UNIT I   PETROCHEMICAL INTRODUCTION   9
Petroleum Exploration, Production and Refining - Constituents of Crude Oil. P & I diagram of petroleum refinery – Atmospheric and Vacuum Distillation of Crude oil Thermal Conversion process – Control of Distillation Column – Temperature and Pressure Control – Feed control, Reflux Control, Reboiler Control

UNIT II   CONTROLS OF CHEMICAL REACTORS   9
Temperature and Pressure Control in reactors – Control of Dryers – Batch and Continuous Dryers. Control of Heat Exchangers and Evaporators – variables and Degrees of freedom – Liquid to Liquid Heat Exchangers – Steam Heaters – Condensers – Reboilers and Vaporizers – Cascade Control – Feed forward Control. Evaporators: Types of Evaporators. Control of Pumps: Centrifugal pump: On-Off level control – Pressure control – Flow control – Throttling control. Reciprocating Pumps: On-Off control and Throttling control.

UNIT III   IRON AND STEEL   9
The need for iron and steel in the civilised world; history of steel making – Process description in diagrammatic and functional block details; raw materials reparation; operation of Blast Furnace (BF) and auxiliary units including stoves; Basic oxygen Furnace (BOF); Electric Furnace (EF); Open Hearth Furnace (OHF); relative merits of various steel making furnaces.

UNIT IV   QUALITY OF STEEL   9
Impurities present and allowed limits for usable steel; waste recycling. casting of steel; primary and secondary rolling,cold rolling; steel finishing operations. Identification of various process parameters in the industry; weighing and proportioning; special gauges for measurement of thickness and shape.

UNIT V   SPECIAL APPLICATIONS FOR CONTROLS   9
Blast Furnace, Stove combustion control system; gas and water control system in Basic Oxygen Furnace ; Mould Level control system in Sand Casting operations. Evolution of computer applications in the industry; Practices for model calculating and data logging; steel rolling mill control; annealing process control; utilities management with computer system.

TOTAL: 45 PERIODS
TEXT BOOKS
1. Dr.Ram Prasad, "Petroleum Refining Technology", Khanna Publisher, 1st Edition, 2000.
2. Considine D. M., "Process/Industrial Instruments and control Handbook", McGraw Hill, 5th Edition 2009.

REFERENCES
1. Liptak B.G., "Instrument Engineers Handbook", Volume II, 2005.
2. Robert H. Perry, D.W. Green and J.O. Maloney, Perry's, "Chemical Engineers, Handbook", McGraw Hill Inc, New York, 8th, 2007.
3. Serope Kalpakjian, "Manufacturing Engineering and Technology", Addison Wesley Publishing Company, Massachusetts, 4th Edition, 2009.

BEI045	ROBOTICS AND AUTOMATION	L T P C
	(Common to EIE, EEE)	3 0 0 3

OBJECTIVES
- To describe the fundamental of robotics, various types of industrial sensors and sources.
- To analyze and perform kinematics of robot systems.
- To understand the control of robots using programming languages.
- To demonstrate the function of robot and automation in industrial activities.

UNIT I   INTRODUCTION   9

Fundamental concepts of robotics: robotics and automation – robot anatomy – types of robotics Asimov's laws of robotics - robot coordinates and control system, specification of Robots: Resolution, Repeatability, Accuracy, degrees of freedom and speed.

UNIT II   SENSORS AND POWER SOURCES   9

Internal state sensors: position sensors and velocity sensors - External state sensors: contact type – Tactile sensors and Force/Torque sensors, Non-contact type: Visual sensors and Proximity/Range sensors - Hydraulic, Pneumatic and Electric drives - Determination of HP of motor and gearing ratio - power transmission systems and control.

UINT III   MANIPULATORS AND GRIPPERS   9

Manipulators: Manipulator Dynamic and Force Control - Electronic and Pneumatic manipulators – manipulator control circuits, Types of End Effector: Mechanical gripper and gripper mechanism - end effector interfaces - Design consideration.

UINT IV   KINEMATICS AND PATH PLANNING   9

Homogeneous coordinates, Homogeneous transformation and manipulator, Forward and Inverse Kinematic problems, Solutions of Inverse Kinematic problems, Jacobian control –Hill climbing techniques - Robot programming languages

UINT V   CASE STUDIES   9

Mutiple robots, Machine interface, Robots in manufacturing and non manufacturing applications, Robot cell design, Selection of robot.

                                                                              TOTAL: 45 PERIODS

TEXT BOOKS
1. Mikell P Groover, "Industrial Robotics - Technology, Programming and Applications", McGraw Hill, 2008.
2. Saeed B. Niku, "Introduction to Robotics Analysis, Systems, Applications", Prentice Hall of India / Pearson Education, Asia, second edition 2010.

REFERENCES
1. J. J. Craig, "Introduction to Robotics, Mechanics and Control", Addison Wesley, MA. Digitized Dec 4, 2007.
2. R. J. Schilling, "Fundamentals of Robotics Analysis and Control", Prentice Hall, NJ, Digitized Dec 5, 2007.
3. Richaerd D Klafter, Thomas Achmielewski and Mickael Negin, "Robotic Engineering - An Integrated Approach", Prentice Hall India, New Delhi, 2001.

BEI046 **MEDICAL INFORMATICS** **L T P C**
3 0 0 3

OBJECTIVES
- To explore the scopes of computers' use in Hospitals and clinical management.
- To effectively use the computers in diagnostic and therauptical devices.

UNIT I INTRODUCTION **9**
History and Structure of Medical Informatics – Internet and Medicine -Security issues, Computer based medical information retrieval, Hospital management and information system, Functional capabilities of a computerized HIS, e-health services, Health Informatics – Medical Informatics, Bioinformatics

UNIT II CIS and CPR **9**
Introduction – Benefits of CIS – Sources of data for decision making – Modes of decision output to physician – CIS in Obstetrics-Gynecology – Clinical decision support – CPR introduction – History - taking by computer – Dialogue with the computer.

UNIT III COMPUTERS IN CLINICAL LABORATORY AND MEDICAL IMAGING **9**
Automated clinical laboratories-Automated methods in hematology, cytology and histology, Intelligent Laboratory Information System - Computerized ECG, EEG and EMG, Computer assisted medical imaging- nuclear medicine, ultrasound imaging ultrasonography-computed X-ray tomography, Radiation therapy and planning.

UNIT IV COMPUTER ASSISTED MEDICAL DECISION-MAKING **9**
Neuro computers and Artificial Neural Networks application, Expert system – General model of CMD, Computer –assisted decision support system-production rule system cognitive model, semantic networks, decisions analysis in clinical medicine-computers in the care of critically patients-computer assisted surgery-Robotics

UNIT V RECENT TRENDS IN MEDICAL INFORMATICS **9**
Virtual reality applications in medicine, Telemedicine, Computer aids for the handicapped, computer assisted instrumentation in Medical Informatics - Computer assisted patient education and health care information.

TOTAL: 45 PERIODS

TEXT BOOKS

1. R.D.Lele, "Computers in Medicine: Progress in Medical Informatics", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
2. Mohan Bansal, "Medical Informatics – A Primer", Tata Mcgraw Hill Publishing Company Limited, New Delhi, 2003.

REFERENCES
1. James A. Reggia, Stanley Tuhrim "Computer-Assisted Medical Decision Making" - Volume 1 (Computers and Medicine), Springer; 1st Edition, June 14, 1985.
2. Shortliffe et al., "Biomedical Informatics, Computer Applications in Health Care and Biomedicine", 3rd Edition, Springer-Verlag, 2006.

BEI047   AUTOMOTIVE INSTRUMENTATION AND CONTROL   L T P C
                                                                             3 0 0 3

OBJECTIVES
- To illustrate the working of panel meters used in automobile panels
- To describe the basic concepts of Indicating Instruments, Warning Instruments used in automobile panels
- To discuss the various Dashboard Amenities, Switching and Control devices.

UNIT I   AUTOMOBILE PANEL METERS AND SENSOR DESIGN   9
Sensor for Fuel Level in Tank, Engine Cooling, Water Temperature Sensors Design, Engine Oil Pressure Sensor Design, Speed Sensor, Vehicle Speed Sensor Design, Air Pressure Sensors, Engine Oil Temperature Sensor, Odometer and Taximeter Design

UNIT II   WARNING AND ALARM INSTRUMENTS   9
Brake Actuation Warning System. Traficators, Flash System, Oil Pressure Warning System, Engine Overheat Warning System, Air Pressure Warning System, Speed Warning System. Door Lock Indicators, Gear Neutral Indicator, Horn Design, Permanent Magnet Horn, Air Horn, Music Horns.

UNIT III   DRIVELINE CONTROL   9
Basic driveline equations, Modeling of neutral gear, State-space formulation, Driveline speed control, Driveline control for gear shifting

UNIT IV   VEHICLE MODELING   9
Vehicle modeling, wheel model, tyre characteristics, complete vehicle model, validation of the model, velocity estimation.

UNIT V   VEHICLE CONTROL SYSTEM   9
Vehicle control system, Antilock Braking Systems (ABS), control cycles of ABS, road model, PID driver model, hybrid driver model, model of human information acquisition, complete driver model.

TOTAL: 45 PERIODS

TEXT BOOKS
1. U.Kiencke, and L. Nielson, "Automotive Control Systems", Springer Verlag Berlin, 2000.
2. Walter E, Billiet and Leslie .F, Goings, "Automotive Electric Systems", American Technical Society, Chicago, 2003.
3. P.L.Kohli, "Automobile Electric Equipments", Tata McGraw Hill Publishing Company Limited, reprint 2006.

REFERENCES
1. A.N.Tripathi, "Linear Systems Analysis", New Age International, 2007.
2. Sigurd Skogestad, Ian Dostiethwaite, "Multivariable Feedback Control: Analysis and Design", Wiley, 2nd Edition, 2005.
3. J.L.Meriam and L.G.Kraige, "Engineering Mechanics, Dynamics", John Wiley and sons, 5th Edition, New York, 2012.
4. Rakesh Kumar, "Transducers Sensors and Display Systems", Oscar Publications, 2010.

BEI048   INSTRUMENTATION IN PETROCHEMICAL INDUSTRIES   L T P C
                                                                                                          3 0 0 3
OBJECTIVES
- To gain the prospective ideas about the unit operations in petroleum industry.
- To acquire knowledge pertaining to the petroleum products and the chemicals obtained from them.
- To attain knowledge in the measurement of various parameters in petrochemical industry.
- To comprehend the various control loops in Petrochemical Industry.

UNIT I   PETROLEUM PROCESSING   9
Petroleum exploration: Seismic method and Electrical method – Recovery techniques: Primary, Secondary and Enhancement methods – Separators: Vertical, Horizontal and Double barrel types - Processing of wet gases: Physical absorption and Chemical absorption methods – Piping and Instrumentation diagram of a Petroleum Refinery.

UNIT II   OPERATIONS IN PETROLEUM INDUSTRY   9
Thermal cracking – Catalytic cracking – Catalytic reforming – Polymerisation – Alkylation – Isomerization – Production of ethylene, acetylene and propylene from petroleum.

UNIT III   CHEMICALS FROM PETROLEUM PRODUCTS   9
Methane derivatives – Acetylene derivatives – Ethylene derivatives – Propylene derivatives.

UNIT IV   MEASUREMENTS IN PETROCHEMICAL INDUSTRY   9
Measurement of Density: Gow-Mac Densitometer, Electromagnetic Suspension Densitometer - Measurement of Viscosity: Capillary Extrusion Viscometer, Automatic Efflux Cup Viscometer - Measurement of Flow rate: Electromagnetic flow meter, Hotwire Anemometer – Measurement of Pressure: Capacitive pressure transducer, LVDT, McLeod gauge - Measurement of Level: Capacitance level indicator, Air purge system - Measurement of Temperature: RTD and its signal conditioning, Optical pyrometer.
Selection and maintenance of measuring instruments – Intrinsic safety of Instruments.

UNIT V   CONTROL LOOPS IN PETROCHEMICAL INDUSTRY   9
Control loops of catalytic crackers and pyrolysis unit – Control loops of polyethylene production – Control loops of vinyl chloride production – Control loops of PVC production.

                                                                                    TOTAL: 45 PERIODS
TEXT BOOKS
1. A.L. Waddams, "Chemicals from Petroleum", Gulf Publishing Company, Book Division; 4th Edition, 1980.
2. J.G. Balchan. and K.I. Mumme, "Process Control Structures and Applications", Van Nostrand Reinhold Company, New York, 1988.

REFERENCES
1. Austin G.T. Shreeves, "Chemical Process Industries", McGraw Hill International Student Edition, Singapore, 1985.
2. B.G Liptak, "Instrumentation in Process Industries", Chilton Book Company, 1994.

BIT014   **COMPUTER ARCHITECTURE**   **L T P C**
                                                                         3 0 0 3

OBJECTIVES
Students will be able to
- Discuss the basic structure and operation of a digital computer.
- Design adders, ALUs, Multipliers, floating point units.
- Employ some of the techniques used to improve the performance of computer at the architectural point of view.
- Discuss several types of memory used in a computer their hierarchy and functions as part of the system.
- Explain the communication process with input and output devices and different mechanisms for interfacing with the peripheral units.

UNIT I   INSTRUCTION SET ARCHITECTURE   9
Introduction to computer architecture - Review of digital design – Instructions and addressing – procedures and data – assembly language programs – instruction set variations

UNIT II   ARITHMETIC/LOGIC UNIT   9
Number representation – design of adders – design of simple ALUs – design of Multipliers and dividers – design of floating point arithmetic unit

UNIT III   DATA PATH AND CONTROL   9
Instruction execution steps – control unit synthesis – microprogramming – pipelining – pipeline Performance

UNIT IV   MEMORY SYSTEM   9
Main Memory concepts – types of memory – cache memory organization – secondary storage – virtual memory – paging

UNIT V   I/O AND INTERFACES   9
I/O devices – I/O programming – polling – interrupts – DMA – buses – links – interfacing – context switching – threads and multithreading

                                                            TOTAL: 45 PERIODS
TEXT BOOKS
   1. B. Parhami, "Computer Architecture", Oxford University Press, 2005.
   2. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization", 5th Edition, Tata McGraw Hill, 2002.

REFERENCES
   1. David A. Patterson and John L. Hennessy, "Computer Organization and Design: Hardware / Software interface", 5th Edition, Elsevier, 2004.
   2. William Stallings, "Computer Organization and Architecture – Designing for Performance", 7th Edition, Pearson Education, 2006.
   3. Miles Murdocca "Computers Architecture and Organization an Integrated approach", India Private Limited, 2007.
   4. John D. Carpinelli, "Computer systems organization and Architecture", Pearson Education, 2001.

BMG701   **TOTAL QUALITY MANAGEMENT**   **L T P C**
                                                                         3 0 0 3
OBJECTIVES
- To introduce the principles of business and social excellence,
- To generate knowledge and skills of students to use models and quality management methodology for the implementation of total quality management in any sphere of business and public sector.

UNIT I   INTRODUCTION   9
Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of manufacturing and service quality - Basic concepts of TQM - Definition of TQM – Contributions of Deming, Juran and Crosby – Cost of Quality, Analysis Techniques for Quality Costs -Barriers to TQM.

UNIT II   TQM PRINCIPLES   9
Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, - Business Excellence Model-Rajiv Gandhi National Quality Award

UNIT III   TQM TOOLS & TECHNIQUES I   9
The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking– Reason to bench mark, Bench marking process – FMEA – Stages, Types.

UNIT IV   TQM TOOLS & TECHNIQUES II   9
Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA.

UNIT V   QUALITY SYSTEMS   9
Need for ISO 9000 -   ISO 9000-2000 Quality System –   Elements, Documentation, Quality auditing- QS 9000 – ISO 14000 – Concepts, Requirements and Benefits – Case studies of TQM implementation in manufacturing and service sectors including IT.
                                                                 TOTAL: 45 PERIODS
TEXT BOOKS
1. Dale H.Besterfiled, et at., "Total Quality Management", Pearson Education Asia, 3rd Edition, Indian Reprint, 2010.
2. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 6th Edition, South-Western (Thomson Learning), 2005.

REFERENCES
1. Oakland, J.S. "TQM – Text with Cases", Butterworth – Heinemann Ltd., Oxford, 3rd Edition, 2003.
2. Suganthi,L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Private Limited, 2006.
3. Janakiraman,B and Gopal, R.K, "Total Quality Management – Text and Cases", Prentice Hall (India) Private Limited, 2006.
4. Ramachandran, S. "Total Quality Management"- Air Walk Publications, 2nd Edition 2008.