SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

Approved by AICTE, Recognized by UGC & Affiliated to Anna University
Accredited by NBA-AICTE, NAAC-UGC with 'A+' Grade

Saravanampatti, Coimbatore-641035

CURRICULA AND SYLLABI

REGULATION 2016

CHOICE BASED CREDIT SYSTEM

DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

B.E. – ELECTRONICS AND INSTRUMENTATION ENGINEERING

SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

REGULATION – 2016

CHOICE BASED CREDIT SYSTEM

SUGGESTED CURRICULUM & SYLLABI

B. E. ELECTRONICS AND INSTRUMENTATION ENGINEERING

SEMESTER I

S. NO.	COURSE CODE	COURSE TITLE	CAT	CONTACT PERIODS	L	T	P	C	PRE-REQUISITES
THEORY									
1.	16EN101	Technical English – I	**HSC**	**3**	3	0	0	3	_
2.	16MA101	Engineering Mathematics – I	**BSC**	**4**	3	1	0	4	_
3.	16PY101	Engineering Physics	**BSC**	**3**	3	0	0	3	_
4.	16CH101	Engineering Chemistry	**BSC**	**3**	3	0	0	3	_
5.	16CS101	Fundamentals of Computing and Programming	**ESC**	**3**	3	0	0	3	_
6.	16GE101	Basic Civil and Mechanical Engineering	**ESC**	**3**	3	0	0	3	_
7.	16GE111/ 16GE113	Career Development Programme I	**EEC**	**3**	1	0	2	2*	_
PRACTICAL									
8.	16CS102	Fundamentals of Computing & Programming Laboratory	**ESC**	**4**	0	0	4	2	_
9.	16PY103	Physics Laboratory	**BSC**	**2**	0	0	2	1	_
10.	16GE102	Engineering Practices Laboratory	**ESC**	**4**	0	0	4	2	_
			TOTAL	**32**	**19**	**1**	**12**	**24+2***	

SEMESTER II

S. NO.	COURSE CODE	COURSE TITLE	CAT	CONTACT PERIODS	L	T	P	C	PRE-REQUISITES
THEORY									
1.	16EN102	Technical English – II	**HSC**	**3**	3	0	0	3	16EN101
2.	16MA102	Engineering Mathematics – II	**BSC**	**4**	3	1	0	4	16MA101
3.	16PY102	Physics of Materials	**BSC**	**3**	3	0	0	3	_

4.	16CH102	Environmental Science and Engineering	**BSC**	**3**	3	0	0	3	_
5.	16EE102	Electric Circuit Analysis	**ESC**	**4**	4	0	0	4	_
6.	16ME104	Engineering Graphics	**ESC**	**5**	3	0	2	4	_
7.	16GE112/ 16ME111	Career Development Programme II	**EEC**	**3**	1	0	2	2*	_
PRACTICAL									
8.	16CH103	Chemistry Laboratory	**BSC**	**2**	0	0	2	1	_
9.	16EN103	Communication Skills Laboratory	**HSC**	**4**	0	0	4	2	_
10.	16EE103	Electric Circuit Laboratory	**ESC**	**2**	0	0	2	1	_
			TOTAL	**33**	**20**	**1**	**12**	**25+2***	

SEMESTER III

S. NO.	COURSE CODE	COURSE TITLE	CAT	CONTACT PERIODS	L	T	P	C	PRE-REQUISITES
THEORY									
1.	16MA201	Transforms And Partial Differential Equations	**BSC**	**4**	3	1	0	4	16MA102
2.	16IT206	Data Structures & Algorithms	**ESC**	**3**	3	0	0	3	16CS101
3.	16EE202	Electronic Devices and Circuits	**PCC**	**3**	3	0	0	3	16PY102
4.	16EE203	Linear and Digital Circuits	**PCC**	**3**	3	0	0	3	**_**
5.	16EI201	Measurements and Instrumentation	**PCC**	**3**	3	0	0	3	**_**
6.	16EI202	Electrical Machines	**PCC**	**3**	3	0	0	3	**_**
7.	16GE211/ 16GE213	Career Development Programme III	**EEC**	**3**	1	0	2	2*	_
PRACTICAL									
8.	16IT207	Data Structures & Algorithms Laboratory	**ESC**	**2**	0	0	2	1	_
9.	16EE209	Analog and Digital Electronics Laboratory	**PCC**	**4**	0	0	4	2	_
10.	16EI220	Electrical Machines Laboratory	**PCC**	**2**	0	0	2	1	_
TOTAL				**30**	**19**	**1**	**10**	**23+2***	

SEMESTER IV

S. NO.	COURSE CODE	COURSE TITLE	CAT	CONTACT PERIODS	L	T	P	C	PRE-REQUISITES
THEORY									
1.	16MA202	Statistics and Numerical Methods	**BSC**	**4**	3	1	0	4	16MA201
2.	16EI211	Introduction to Control Systems	**PCC**	**5**	3	0	1	4	16MA102
3.	16EI212	Industrial Instrumentation – I	**PCC**	**3**	3	0	0	3	–
4.	16EI213	Transducer Engineering	**PCC**	**3**	3	0	0	3	–
5.	16EI214	Industrial Electronics	**PCC**	**3**	3	0	0	3	–
6.	16ME214	Thermofludics for instrumentation	**PCC**	**4**	3	1	0	4	–
7.	16GE212/ 16GE214	Career Development ProgrammeIV	**EEC**	**3**	1	0	2	2*	–
PRACTICAL									
8.	16EI230	Thermofludics Laboratory	**PCC**	**2**	0	0	2	1	–
9.	16ME215	Fluid Mechanics and Thermodynamics Laboratory	**PCC**	**4**	0	0	4	2	–
			TOTAL	**31**	**19**	**2**	**9**	**24+2***	

SEMESTER V

S. NO.	COURSE CODE	COURSE TITLE	CAT	CONTACT PERIODS	L	T	P	C	PRE-REQUISITES
THEORY									
1.	16GE301	Professional Ethics	**HSC**	**3**	3	0	0	3	–
2.	16CS451	Object Oriented Programming using C++	**ESC**	**3**	3	0	0	3	–
3.	16EI301	PIC Microcontrollers and ARM Processor	**PCC**	**5**	3	0	1	4	16EE220
4.	16EI302	Industrial Instrumentation – II	**PCC**	**3**	3	0	0	3	16EI207, 16EI208
5.		Professional Elective – I	**PEC**	**3**	3	0	0	3	–
6.		Open Elective – I	**PEC**	**3**	3	0	0	3	–

7.	16EI310/ 16GE313	Career Development Programme V	**EEC**	**3**	1	0	2	2*	_
PRACTICAL									
8.	16CS452	Object Oriented Programming using C++ Laboratory	**ESC**	**4**	0	0	4	2	_
9.	16EI320	PIC Microcontrollers and ARM Processor Laboratory	**PCC**	**2**	0	0	2	1	_
10.	16EI321	Industrial Instrumentation Laboratory	**PCC**	**2**	0	0	2	1	16EI207 16EI210 16EI302
			TOTAL	**31**	**19**	**0**	**11**	**23+2***	

SEMESTER VI

S. NO.	COURSE CODE	COURSE TITLE	CAT	CONTACT PERIODS	L	T	P	C	PRE-REQUISITES
THEORY									
1.	16EI324	PLC & SCADA	**EEC**	**4**	3	0	0	3	_
2.	16EI322	Virtual Instrumentation	**EEC**	**4**	3	0	0	3	_
3.	16EI323	Process Control	**PCC**	**3**	3	0	0	3	16EI207, 16EI302
4.	16CS453	Programming in JAVA	**ESC**	**3**	3	0	0	3	16CS321
5.		Professional Elective – II	**PEC**	**3**	3	0	0	3	_
6.		Open Elective – II**	**OEC**	**3**	3	0	0	3	_
7.	16GE312 /16GE314	Career Development Programme VI	**EEC**	**3**	1	0	2	2*	_
PRACTICAL									
8.	16CS454	JAVA Programming Laboratory	**ESC**	**4**	0	0	4	2	16CS321
9.	16EI326	System Design and Development Laboratory	**EEC**	**2**	0	0	2	1	_
10.	16EI327	Process Control System Laboratory	**PCC**	**2**	0	0	2	1	_
			TOTAL	**33**	**19**	**0**	**10**	**22+2***	

SEMESTER VII

S. NO.	COURSE CODE	COURSE TITLE	CAT	CONTACT PERIODS	L	T	P	C	PRE-REQUISITES
THEORY									
1.	16GE302	Engineering Economics and Cost Analysis	**HSC**	**3**	3	0	0	3	_
2.		Professional Elective – III	**PEC**	**3**	3	0	0	3	_
3.		Professional Elective – IV	**PEC**	**3**	3	0	0	3	_
4.		Professional Elective – V	**PEC**	**3**	3	0	0	3	_
5.		Professional Elective – VI	**PEC**	**3**	3	0	0	3	_
6.		Open Elective – III**	**OEC**	**3**	3	0	0	3	_
PRACTICAL									
6.	16EI420	Instrumentation System Design Laboratory	**PCC**	**4**	0	0	4	3	16EI208 16EI309
7.	16EI421	Project Work – Phase I	**EEC**	**4**	0	0	4	2	_
			TOTAL	**26**	**18**	**0**	**8**	**23**	

SEMESTER VIII

S. NO.	COURSE CODE	COURSE TITLE	CAT	CONTACT PERIODS	L	T	P	C	PRE-REQUISITES
THEORY									
1.	16EI411	Power Plant Instrumentation	**PCC**	**3**	3	0	0	3	16EI308, 16EI309
2.		Professional Elective – VII	**PEC**	**3**	3	0	0	3	_
PRACTICAL									
3.	16EI426	Project Work – Phase II	**EEC**	**20**	0	0	20	10	
			TOTAL	**26**	**6**	**0**	**20**	**16**	

TOTAL NO. OF CREDITS: 180

***Not included in the calculation of CGPA**

****Courses from the curriculum of other UG Programmes**

HUMANITIES AND SOCIAL SCIENCES COURSES (HSC)

S.NO.	COURSE CODE	COURSE TITLE	CONTACT PERIODS	L	T	P	C	PRE-REQUISITES
1.	16EN101	Technical English – I	3	3	0	0	3	_
2.	16EN102	Technical English – II	3	3	0	0	3	_
3.	16GE301	Professional Ethics	3	3	0	0	3	_
4.	16GE302	Engineering Economics and Cost Analysis	3	3	0	0	3	_
5.	16EN103	Communication Skills Laboratory	4	0	0	4	2	_

BASIC SCIENCES COURSES (BSC)

S.NO.	COURSE CODE	COURSE TITLE	CONTACT PERIODS	L	T	P	C	PRE-REQUISITES
1.	16MA101	Engineering Mathematics – I	4	3	1	0	4	_
2.	16PY101	Engineering Physics	3	3	0	0	3	_
3.	16CH101	Engineering Chemistry	3	3	0	0	3	_
4.	16MA102	Engineering Mathematics – II	4	3	1	0	4	16MA101
5.	16PY102	Physics of Materials	3	3	0	0	3	16PY101
6.	16CH102	Environmental Science and Engineering	3	3	0	0	3	_
7.	16MA201	Transforms and Partial Differential Equations	4	3	1	0	4	16MA102
8.	16MA202	Statistics and Numerical Methods	4	3	1	0	4	16MA201
9.	16PY103	Physics Laboratory	2	0	0	2	1	_
10.	16CH103	Chemistry Laboratory	2	0	0	2	1	_

ENGINEERING SCIENCES COURSES (ESC)

S.NO.	COURSE CODE	COURSE TITLE	CONTACT PERIODS	L	T	P	C	PRE-REQUISITES
1.	16CS101	Fundamentals of Computing and Programming	3	3	0	0	3	
2.	16GE101	Basic Civil and Mechanical Engineering	3	3	0	0	3	
3.	16ME104	Engineering Graphics	5	3	0	2	4	
4.	16EE102	Electric Circuit Analysis	4	4	0	0	4	
5.	16IT206	Data Structures & Algorithms	3	3	0	0	3	16CS101

6.	16CS451	Object Oriented Programming using C++	3	3	0	0	3	–
7.	16CS453	Programming in JAVA	3	3	0	0	3	16CS321
8.	16CS102	Fundamentals of Computing & Programming Laboratory	4	0	0	4	2	–
9.	16GE102	Engineering Practices Laboratory	4	0	0	4	2	–
10.	16EE103	Electric Circuit Laboratory	2	0	0	2	1	–
11.	16IT207	Data Structures & Algorithms Laboratory	2	0	0	2	1	–
12.	16CS452	Object Oriented Programming using C++ Laboratory	4	0	0	4	2	–
13.	16CS454	JAVA Programming Laboratory	4	0	0	4	2	16CS321
14.	16EI320	PIC Microcontrollers and ARM Processor Laboratory	2	0	0	2	1	–

PROFESSIONAL CORE COURSES (PCC)

S.NO.	COURSE CODE	COURSE TITLE	CONTACT PERIODS	L	T	P	C	PRE-REQUISITES
1.	16EE202	Electronic Devices and Circuits	3	3	0	0	3	16PY102
2.	16EE203	Linear and Digital Circuits	3	3	0	0	3	–
3.	16EI201	Measurements and Instrumentation	3	3	0	0	3	–
4.	16EI202	Electrical Machines	3	3	0	0	3	–
5.	16EI211	Introduction to Control Systems	4	3	0	1	4	16MA102
6.	16EI212	Industrial Instrumentation – I	3	3	0	0	3	–
7.	16EI213	Transducer Engineering	3	3	0	0	3	–
8.	16EI214	Industrial Electronics	3	3	0	0	3	–
9.	16ME214	Thermofludics for instrumentation	4	3	1	0	4	–
10.	16EI301	PIC Microcontrollers and ARM Processor	5	3	0	1	4	16EE220
11.	16EI302	Industrial Instrumentation – II	3	3	0	0	3	16EI207, 16EI208
12.	16EI323	Process Control	3	3	0	0	3	16EI207, 16EI302
13.	16EI411	Power plant instrumentation	3	3	0	0	3	16EI308, 16EI309

14.	16EE209	Analog and Digital Electronics Laboratory	4	0	0	4	2	_
15.	16EI220	Electrical Machines Laboratory	2	0	0	2	1	_
16.	16EI230	Transducers and Measurements Laboratory	2	0	0	2	1	_
17.	16ME215	Thermofludics Laboratory	4	0	0	4	2	_
18.	16EI320	PIC Microcontrollers and ARM Processor Laboratory	2	0	0	2	1	_
19.	16EI321	Industrial Instrumentation Laboratory	2	0	0	2	1	16EI207 16EI210 16EI302
20.	16EI326	System Design and Development Laboratory	2	0	0	2	1	_
21.	16EI327	Process control system laboratory	2	0	0	2	1	_
22.	16EI420	Instrumentation System Design Laboratory	4	0	0	4	3	16EI208 16EI309

PROFESSIONAL ELECTIVE COURSES (PEC)

PROFESSIONAL ELECTIVE - I

S.NO.	COURSE CODE	COURSE TITLE	CONTACT PERIODS	L	T	P	C	PRE-REQUISITES
1.	16EI350	Analytical Instrumentation	3	3	0	0	3	16EE202
2.	16EE320	Embedded Systems	3	3	0	0	3	16EE220, 16EI301
3.	16EI351	Digital System Design	3	3	0	0	3	16EE220
4.	16EC358	Digital Image Processing	3	3	0	0	3	_

PROFESSIONAL ELECTIVE - II

S.NO.	COURSE CODE	COURSE TITLE	CONTACT PERIODS	L	T	P	C	PRE-REQUISITES
1.	16EC331	Communication Engineering	3	3	0	0	3	–
2.	16IT420	Social Network Analysis	3	3	0	0	3	_
3.	16EI360	Fibre Optics and Laser Instruments	3	3	0	0	3	–
4.	16EC332	Digital Signal Processing	3	3	0	0	3	_

PROFESSIONAL ELECTIVE – III

S.NO.	COURSE CODE	COURSE TITLE	CONTACT PERIODS	L	T	P	C	PRE-REQUISITES
1.	16GE304	Principles of Management	3	3	0	0	3	_
2.	16GE305	Intellectual Property Rights	3	3	0	0	3	_
3.	16GE303	Total Quality Management	3	3	0	0	3	_
4.	16GE306	HRM & Entrepreneurship	3	3	0	0	3	_

PROFESSIONAL ELECTIVE - IV

S.NO.	COURSE CODE	COURSE TITLE	CONTACT PERIODS	L	T	P	C	PRE-REQUISITES
1.	16EI450	Robotics and Automation	3	3	0	0	3	_
2.	16EI451	Advanced Process Control	3	3	0	0	3	16EI309
3.	16EI452	Neural Networks and Fuzzy Logic	3	3	0	0	3	_
4.	16EI453	Design of Process Control System Components	3	3	0	0	3	16EI309

PROFESSIONAL ELECTIVE - V

S.NO.	COURSE CODE	COURSE TITLE	CONTACT PERIODS	L	T	P	C	PRE-REQUISITES
1.	16EI460	Industrial Data Networks	3	3	0	0	3	_
2.	16EI461	Instrumentation System Design	3	3	0	0	3	16EI309
3.	16EI462	Web Based Instrumentation	3	3	0	0	3	_
4.	16EE428	Advanced Control System	3	3	0	0	3	16EE207

PROFESSIONAL ELECTIVE - VI

S.NO.	COURSE CODE	COURSE TITLE	CONTACT PERIODS	L	T	P	C	PRE-REQUISITES
1.	16EI470	Instrumentation and Control in Process Industries	3	3	0	0	3	_
2.	16EI471	Computer Control of Processes	3	3	0	0	3	16EE207
3.	16EI472	Process Modeling and Simulation	3	3	0	0	3	16EE207
4.	16EC303	VLSI Design	3	3	0	0	3	16EE220

PROFESSIONAL ELECTIVE - VII

S.NO.	COURSE CODE	COURSE TITLE	CONTACT PERIODS	L	T	P	C	PRE-REQUISITES
1.	16EI480	Biomedical Instrumentation	3	3	0	0	3	16EI207, 16EI302
2.	16EI481	Instrumentation in Petrochemical, Paper and Steel Industries	3	3	0	0	3	16EI207, 16EI302
3.	16EI482	Distributed Control Systems	3	3	0	0	3	–
4.	16EI483	Micro Electro Mechanical Systems	3	3	0	0	3	–

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S.NO.	COURSE CODE	COURSE TITLE	CONTACT PERIODS	L	T	P	C	PRE-REQUISITES
1.	16GE111/ 16GE113	Career Development Programme I	3	1	0	2	2*	–
2.	16GE112/ 16ME111	Career Development Programme II	3	1	0	2	2*	–
3.	16GE211/ 16GE213	Career Development Programme III	3	1	0	2	2*	–
4.	16GE212/ 16GE214	Career Development Programme IV	3	1	0	2	2*	–
5.	16EI310/ 16GE313	Career Development Programme V	3	1	0	2	2*	–
6.	16GE312/ 16GE314	Career Development Programme VI	3	1	0	2	2*	–
7.	16EI322	Virtual Instrumentation	3	3	0	0	3	–
8.	16EI421	Project Work – Phase I	4	0	0	4	2	–
9.	16EI425	Project Work – Phase II	20	0	0	20	10	–

OPEN ELECTIVE OFFERED TO OTHER PROGRAMMES

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C	PRE-REQUISITES
1.	16EIOE1	Basics of PLC	3	0	0	3	–
2.	16EIOE2	Data Networks	3	0	0	3	–
3.	16EIOE3	Basics of Neural Networks and Fuzzy Logic System	3	0	0	3	–
4.	16EIOE4	Sensors and Transducers	3	0	0	3	–

ONE CREDIT COURSES

S.NO	COURSE CODE	COURSE TITLE
1	16EIOC1	Arduino
2	16EIOC2	Raspberry Pi
3	16EIOC3	Industrial Safety & Field Instruments
4	16EIOC4	Industrial Robotics
5	16EIOC5	Piping & Instrumentation
6	16EIOC6	Distributed Control System

SUMMARY

S. No.	SUBJECT AREA	Credits Per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	**HSC**	3	5	-	-	3	-	3	-	**14**
2	**BSC**	11	11	4	4	-	-	-	-	**30**
3	**ESC**	10	9	4	-	5	5	-	-	**33**
4	**PCC**	-	-	15	20	9	4	3	3	**54**
5	**PEC**	-	-	-	-	6	3	12	3	**24**
6	**OEC**	-	-	-	-	-	3	3	-	**6**
7	**EEC**	-	-	-	-	-	7	2	10	**19**
	TOTAL	**24**	**25**	**23**	**24**	**23**	**22**	**23**	**16**	**180**
8.	**Non-Credit / Mandatory**	**2**	**2**	**2**	**2**	**2**	**2**	**-**	**-**	**-**

16EN101	TECHNICAL ENGLISH I	L	T	P	C
	(Common to all B.E. / B. Tech. Courses)	3	0	0	3

UNIT I **9**

General Vocabulary (Word–formation - prefixes & suffixes, root words) – Tenses – Adjectives forms – Adverb forms - Compound nouns - Abbreviations and Acronyms –Techniques of reading – Autobiographical writing.

UNIT II **9**

Active and Passive voice – Impersonal passive voice - Articles - Prepositions –Spelling and Punctuation –'WH' Question forms – Yes / No question form – Reading & note-making – Paragraph writing - comparison and contrast.

UNIT III **9**

Uses of Modal auxiliaries – Instructions– Definitions - Single line & Extended - Reading and understanding through Context –Transfer of information – bar chart, flowchart- Crafting advertisements.

UNIT IV **9**

Concord (subject & verb agreement) – Cause and effect expressions – One word substitution - Letter writing- letter to the editor & permission letter (for Industrial Visit & In-plant training) - Paragraph writing-descriptive.

UNIT V **9**

Empty verbs - 'If' conditionals – Gerund & Infinitive - Formal Letter writing – invitation, accepting & declining - Paragraph writing – analytical.

L :45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 Dhanavel.S.P. English and Communication Skills for Students of Science and Engineering, Orient Blackswan, Chennai, 2011.

2. Gunasekaran.S , ' Technical English I' Third Edition, Vishnu Prints Media, Chennai, 2016.

REFERENCES

1 Raman, Meenakshi & Sangeetha Sharma. Technical Communication: Principles and Practice, Oxford University Press, New Delhi, 2011. .

2 Regional Institute of English. English for Engineers, Cambridge University Press, New Delhi, 2006.

3 Rizvi, Ashraf. M. Effective Technical Communication, Tata McGraw-Hill, New Delhi, 2005.

4 Department of English, Anna University, Mindscapes: English for Technologists and Engineers. Orient Blackswan, Chennai. 2012.

5 Mitra K. Barun, "Effective Technical Communication – A Guide for Scientists and Engineers", Oxford University Press, New Delhi, 2006.

COURSE OUTCOMES

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

CO1 Employ their active and passive vocabulary and construct basic sentence structures.

CO2 Become active readers who appreciate ambiguity and complexity, and who can articulate their own interpretations.

CO3 Write effectively and flawlessly avoiding grammatical errors for a variety of professional and social settings.

CO4 Demonstrate the usage of language effectively, creatively and successfully in both general and specific contexts.

CO5 Exhibit letter writing skills for effective communication both in formal and informal situations.

16MA101	ENGINEERING MATHEMATICS- I	L	T	P	C
	(Common to All B.E. / B. Tech. Courses)	3	1	0	4

UNIT I MATRICES 9+3

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

UNIT II THREE DIMENSIONAL ANALYTICAL GEOMETRY 9+3

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 9+3

Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes.

UNIT IV FUNCTIONS OF SEVERAL VARIABLES 9+3

Partial derivatives – Euler's theorem for homogenous functions – Total derivatives – Jacobians – Taylor's expansion– Maxima and Minima – Method of Lagrangian multipliers.

UNIT V DIFFERENTIAL EQUATIONS OF HIGHER ORDER 9+3

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear differential equations.

L :45 T:15 P: 0 Total: 60 PERIODS

TEXT BOOKS

1. Bali, N. P. and Manish Goyal, "Text book of Engineering Mathematics", 4th Edition, University Science Press, 2014.
2. Grewal, B.S., "Higher Engineering Mathematics", 43rd Edition, Khanna Publications, Delhi, 2014.

REFERENCES

1. Ramana, B.V., "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, 2014.
2. Kandasamy, P., Thilagavathy, K. and Gunavathy, K., "Engineering Mathematics", Volume I., S. Chand & Co., New Delhi, 2012.
3. Veerarajan, T., "Engineering Mathematics for First Year", Tata McGraw Hill Pub. Co. Ltd., New Delhi, 2014.
4. Kreyszig, E., "Advanced Engineering Mathematics", 8th Edition, John Wiley & Sons, Inc, Singapore, 2008.
5. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education Ltd., 2013.

COURSE OUTCOMES

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

CO1 Know Eigen values and Eigen vectors and its role in the system of equations.
CO2 Explore the knowledge to solving problems involving Sphere, Cone and Cylinder.
CO3 Discover the radius, centre and circle of curvature of any curves.
CO4 Identify the maximum and minimum values of surfaces.
CO5 Solve the ordinary differential equations of certain types.

16PY101	ENGINEERING PHYSICS	L	T	P	C
	(Common to All B.E. / B. Tech. Courses)	3	0	0	3

UNIT I CRYSTAL PHYSICS 9

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

UNIT II PROPERTIES OF MATTER AND THERMAL PHYSICS 9

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

UNIT III QUANTUM PHYSICS 9

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

UNIT IV ACOUSTICS AND ULTRASONICS 9

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

UNIT V PHOTONICS AND FIBRE OPTICS 9

Spontaneous and stimulated emission- Population inversion -Einstein's A and B coefficients - derivation. Types of lasers – Nd:YAG, CO , Semiconductor lasers –applications. Principle and propagation of light in optical fibres – Numerical aperture and Acceptance angle - Types of optical fibres (material, refractive index, mode) – Losses in optical fibre- attenuation, dispersion, bending - Fibre Optical Communication system (Block diagram)

L :45 T: 0 P: 0 T: 45 PERIODS

TEXT BOOKS

1. Naresh Kumar. P and Balasubramanian. V, Engineering Physics I, Gems Publishers, 2015
2. Avadhanalu.M.N and Kshirsagar.P.G, A textbook of Engineering Physics, S. Chand & company Ltd, 2013.

REFERENCES

1. Searls and Zemansky, University Physics, 2009.
2. Gaur R.K. And Gupta S.L, Engineering Physics, Dhanpat Rai publishers, 2009.
3. Palanisamy P.K, Engineering Physics, SCITECH Publications, 2011.
4. Rajendran.V, Engineering Physics, Tata Mc graw-Hill Publishing Company Limited, New Delhi.2009.
5. Dr.G.Senthil kumar, Engineering Physics-I, VRB Publishers Pvt.Ltd. Chennai. (2013).

COURSE OUTCOMES :

At the end of the course student should be able to

- **CO1** Understand the properties of the crystalline materials.
- **CO2** Analyze the elastic and thermal properties of the materials.
- **CO3** Understand the basics of quantum mechanics.
- **CO4** Identify the applications of acoustics and ultrasonic waves.
- **CO5** Understand the basics and applications of photonics and fibre optics technology.

16CH101	ENGINEERING CHEMISTRY	L	T	P	C
	(Common to All B.E. / B. Tech. Courses)	3	0	0	3

UNIT I ELECTRO CHEMISTRY 9

Electrochemical - EMF – Electrode potential – Nernst equation — problem – electrochemical series – significance– reference electrodes –Standard Hydrogen electrode - Calomel electrode – Ion selective electrode – glass electrode and measurement of pH and Fuel cells – hydrogen – oxygen fuel cell – batteries – Primary — Leclanche cell – secondary – Lead – acid battery – Lithium batteries (Li-TiS_2 and Li - S battery).

UNIT II CORROSION AND ITS CONTROL 9

Chemical corrosion – oxidation corrosion – mechanism – Pilling – Bed worth rule – electrochemical corrosion – different types – galvanic corrosion – differential aeration corrosion – corrosion control – sacrificial anode and impressed cathodic current methods – corrosion inhibitors – protective coatings – paints – constituents and functions – metallic coatings – electroplating (Gold plating).

UNIT III SPECTROSCOPY 9

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

UNIT IV SURFACE CHEMISTRY & WATER TECHNOLOGY 9

Adsorption – types – adsorption of gases on solids – adsorption isotherms – Frendlich and Langmuir isotherms – – role of adsorbents in ion-exchange adsorption (Demineralization only). Water – hardness – problems – Domestic water treatment – disinfection methods (Chlorination, Ozonation, UV treatment) – break point chlorination – salinity – desalination by reverse osmosis

UNIT V ENGINEERING MATERIALS 9

Refractories – classification – acidic, basic and neutral refractories – properties (refractoriness, refractoriness under load, dimensional stability, porosity, thermal spalling) Abrasives – natural and synthetic abrasives – quartz, corundum, emery, garnet, diamond, silicon carbide and boron carbide. Lubricants – mechanism of lubrication - properties – viscosity index, flash and fire points, cloud and pour points, oiliness) – solid lubricants – graphite and molybdenum sulphide.

L :45 T: 0 P: 0 Total :45 PERIODS

TEXT BOOKS

1 M.Manjuladevi, R.Anitha "Engineering Chemistry" Gem Pub. Coimbatore. 2013.
2. P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi 2008.

REFERENCES

1 B. Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2009).
2 R. Sivakumar and N Sivakumar, "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd. New Delhi.2009.
3 Dr.Gourkrishna and Dasmohapatra, "Engineering Chemistry" Vikas Pub. House Pvt.Ltd. 2011.
4 O.Gpalanna, "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi.2009.
5 B.R.Puri,L.R.Sharma&M.S.Pathania,"Principles of Physical Chemistry" Vishalpublishing Co. Jalandhar, Punjab. 2013.

COURSE OUTCOMES :

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

CO1 Assemble a battery and illustrate the phenomenon of production of electric current

CO2 Know the technical information about corrosion, corrosion control by galvanization and electroplating

CO3 Gain knowledge on the principles and instrumentation of spectroscopic techniques

CO4 Apply the theory of adsorption in real life situations

CO5 Acquire sound knowledge on different types of Engineering materials

16CS101	FUNDAMENTALS OF COMPUTING AND PROGRAMMING	L	T	P	C
	(Common to All B.E. / B. Tech.)	3	0	0	3

UNIT I INTRODUCTION TO COMPUTERS 8

Introduction – Characteristics of Computers –Computer Generations – Classification of Computers – Basic Computer organization – Number Systems- Algorithm –Pseudo code –Flow Chart- Computer Software –Types of Software– Internet Terminology

UNIT II C PROGRAMMING BASICS 10

Introduction to 'C' programming –fundamental Rules–structure of a 'C' program –compilation and linking processes –Constants, Variables, keywords, Identifier, Delimiters –Declaring and Initializing variables–Data Types –Operators and Expressions–Managing Input and Output operations –Decision Making and Branching –Looping statements –solving simple scientific and statistical problems.

UNIT III ARRAYS AND STRINGS 10

Arrays – Characteristics, Initialization – Declaration – One dimensional and two dimensional arrays. String- String operations – String Arrays. Simple programs-sorting-searching –matrix operations (Addition, subtraction and Multiplication).

UNIT IV FUNCTIONS AND POINTERS 9

Function –definition of function – User-defined Functions - Declaration of function – Call by reference – Call by value –Recursion –Pointers -Definition –Initialization –Pointers arithmetic –Pointers and arrays-Example Problems.

UNIT V STRUCTURES AND UNIONS 8

Defining Structures and Unions–Structure declaration –need for structure data type - Structure within a structure- Union -Programs using structures and Unions- Pre-processor directives.

L : 45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 E.Balagurusamy, "Fundamentals of Computing and Computer Programming", Tata McGraw-Hill Publishing Company Limited, (2011).

2. Ashok.N.Kamthane," Computer Programming", Pearson Education (India) (2010).

REFERENCES

1 Byron Gottfried, "Programming with C", 2nd Edition, (Indian Adapted Edition), TMH Publications, (2006).

2 Stephan G kochan, "Programming in C" Pearson Education (2010).

3 P.Sudharson, "Computer Programming", RBA Publications (2008).

4 Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.

5 Yashavant P. Kanetkar. "Let Us C", BPB Publications, 2011.

COURSE OUTCOMES

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

CO1 Distinguish the differences among the various generation and classification of computers and solve problems in number system

CO2 Understand the basic concepts of C programming and write programs using various control statements

CO3 Implement programs using arrays and apply the concepts to solve basic problems

CO4 Write C programs to solve problems using functions and pointers

CO5 Understand the concepts structures and unions and apply them

16GE101	BASIC CIVIL AND MECHANICAL ENGINEERING	L	T	P	C
	(Common to all B.E. / B. Tech. Courses)	3	0	0	3

UNIT I CIVIL ENGINEERING MATERIALS AND SURVEYING 9

Introduction: Civil engineering-scope of civil engineering-building materials- Brick, stone, cement, concrete, properties-uses Surveying: Objects – types – classification – principles – measurements of distances – angles – leveling – determination of areas – illustrative examples.

UNIT II BUILDING COMPONENTS 9

Foundations: Types, Bearing capacity – Requirement of good foundations.

Superstructure: Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring plastering.

UNIT III POWER PLANT ENGINEERING 9

Introduction, Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydro-electric and Nuclear Power plants – Merits and Demerits – working principle of Pumps - Single, Double acting and Centrifugal Pumps.

UNIT IV IC ENGINES, REFRIGERATION AND AIR CONDITIONING SYSTEM 9

Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles –Principle of Vapour compression system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.

UNIT V BASIC MANUFACTURING PROCESSES 9

Foundry: Introduction- patterns – Moulding – casting - cupola furnace.

Welding: Introduction-Classification – ARC, TIG, MIG welding, Gas welding, soldering and brazing.

Machining process: Introduction-Classification – lathe and drilling machines.

L : 45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 Naveen Sait.A., Soundararajan.R., "Basic Civil and Mechanical Engineering", RP Publications, Coimbatore, [2016).

2. Shanmugam G and Palanichamy M S, "Basic Civil and Mechanical Engineering", Tata McGraw Hill Publishing Co., New Delhi, (2016).

REFERENCES

1 Rangwala,S.C., " Engineering Materials" , Charotar Publishing House, Anand, 2014.

2 Surendra Singh, "Building Materials" Vikas Publishing Company, New Delhi, 2015.

3 Venugopal K and Prahu Raja V, "Basic Mechanical Engineering", AnuradhaPublishers, Kumbakonam, (2016).

4 Shantha Kumar S R J., "Basic Mechanical Engineering", Hi-tech Publications, Mayiladuthurai, (2016).

5 Rao, P N, Manufacturing Technology: Foundry, Forming And Welding", Tata McGraw-Hill, New Delhi, 2015.

COURSE OUTCOMES

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

CO1 Describe about building materials & surveying equipments in real time.

CO2 Outline the basic building components and requirements of good foundation.

CO3 Identify the possibilities of energy conversion from various energy sources using power plants.

CO4 Summarize the working principles of various Mechanical systems used in day to day applications.

CO5 Apply the various basic Manufacturing processes to make products.

16GE111	CAREER DEVELOPMENT PROGRAMME - I	L	T	P	C
	(Common to All B.E. / B. Tech. Courses)	1	0	2	2*

UNIT I TRAINING FUNDAMENTALS 3+6

Goal Settings – Insights into pre-placement requisites – SWOT Analysis – LSRW Skills.

UNIT II LINGUISTIC SKILLS I 3+6

Parts of Speech – Noun, Verb, Participle, Articles, Pronoun, Preposition, Adverb, Conjunction – Logical sequence of words –Tense & Voice – Comparison – Comprehension – comprehend and understand a paragraph

UNIT III QUANTITATIVE ABILITY I 3+6

Number theory – Percentage – Profit, loss and discount – Simple and compound interest.

UNIT IV QUANTITATIVE ABILITY II 3+6

Ratio & Proportions – Partnership – Problems on Average & Ages – Clocks – Time sequence test.

UNIT V COMMUNICATION SKILLS 3+6

Impromptu Speech – Group Discussion – Questioning Technique.

L:15 T: 0 P:30 Total: 45 PERIODS

TEXT BOOKS

1 John Eastwood, "Oxford Practice Grammar", Oxford, 2006.
2. Rajesh Varma, "Fast Track Objective Arithmetic", Arihant Publications, 2010.

REFERENCES

1 Barun K. Mithra, 2016, "Personality Development & Soft Skills", Oxford.
2 R.V.Praveen, "Quantitative Aptitude and Reasoning" PHI Publication, 2012.
3 R.S.Agarwal, "Quantitative Aptitude for Competitive Examinations", S.Chand & Company Pvt Limited, 2016.
4 Arun Sharma - Quantitative Aptitude for CAT.
5 Dr. Rishipal and Dr. Jyoti Sheoran "Business Communication", SPD Publisher, 2014.

COURSE OUTCOMES

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

CO1 Set their career goals through SWOT analysis.
CO2 Form sentences through logical sequence of words and understand passage through Comprehension
CO3 Apply the shortcut methods in quantitative aptitude.
CO4 Solve application orientated concepts in quantitative aptitude.
CO5 Communicate well and familiarize with the questioning techniques.

16GE113	CAREER DEVELOPMENT PROGRAMME - I	L	T	P	C
	(Common to All B.E. / B. Tech. Courses)	1	0	2	2*

UNIT I TRAINING FUNDAMENTALS 8

Goal Settings – Insights into pre-placement requisites – SWOT Analysis – LSRW Skills.

UNIT II LINGUISTIC SKILLS I 12

Parts of Speech – Error spotting, Logical sequence of words, Tense & Voice, Comparison, Paragraph completion.

UNIT III LINGUISTIC SKILLS II 8

Comprehend – comprehend and understand a paragraph, Sentences - Simple, Compound & Complex sentences, Jumbled sentence, Idioms & Phrases.

UNIT IV PERSONALITY DEVELOPMENT 9

Personality, Presentation Skills – stages, selection of topic, content & aids, Minutes of meeting, Public speaking.

UNIT V COMMUNICATION SKILLS 8

Impromptu Speech – Group Discussion – Questioning Technique.

L:15 T:0 P: 30 Total: 45 PERIODS

TEXT BOOKS

1 John Eastwood, "Oxford Practice Grammar", Oxford.
2. Barun K. Mithra, "Personality Development & Soft Skills", Oxford.

REFERENCES

1 Barun K. Mithra, 2016, "Personality Development & Soft Skills", Oxford.
2 R.V.Praveen, "Quantitative Aptitude and Reasoning" PHI Publication, 2012.
3 R.S.Agarwal, "Quantitative Aptitude for Competitive Examinations", S.Chand & Company Pvt Limited, 2016.
4 Arun Sharma - Quantitative Aptitude for CAT.
5 Dr. Rishipal and Dr. Jyoti Sheoran "Business Communication", SPD Publisher, 2014.

COURSE OUTCOMES

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

CO1 Understand language structures and functioning of the language.
CO2 Analyse the parts of speech.
CO3 Demonstrate knowledge of personal beliefs and values.
CO4 Understand language attitudes.
CO5 Raise the basic language skills.

16CS102	FUNDAMENTALS OF COMPUTING AND PROGRAMMING LABORATORY (Common to All B.E. / B. Tech.)	L 0	T 0	P 4	C 2

LIST OF EXPERIMENTS

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.

C) Simple C Programming

1. Data types, Expression Evaluation, Condition Statements.
2. Arrays , Looping Statement
3. Functions , Pointers
4. Structures and Unions

MAJOR EQUIPMENTS / SOFTWARE REQUIRED

Hardware

- LAN System with 33 nodes (OR) Standalone PCs – 33 Nos.
- Printers – 3 Nos.

Software

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

L : 0 T: 0 P: 60 Total: 60 PERIODS

COURSE OUTCOMES

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

CO1	Create a document, insert formulas and pictures and prepare letters using MS office
CO2	Create tables and charts, use formula in calculations and protect worksheets in MS Excel
CO3	Write simple programs using basic C Concepts
CO4	Write C programs using concepts in control statements
CO5	Write C programs to solve problems using Arrays, Functions, Pointers, Unions, and Structures

16PY103	PHYSICS LABORATORY	L	T	P	C
	(Common to All B.E. / B. Tech. Courses)	0	0	2	1

LIST OF EXPERIMENTS

1. Determination of wavelength of mercury spectrum – Spectrometer grating
2. Determination of Young's modulus of the material – uniform bending.
3. Determination of viscosity of liquid – Poiseuille's method.
   (a) Particle size determination using Diode Laser.
   (b) Determination of Laser parameters – Wavelength.
4. Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
5. Determination of thickness of a thin wire – Air wedge method.
6. Determination of dispersive power of a prism using spectrometer.
7. Determination of Young's modulus of the material – non uniform bending.
8. Torsional Pendulum - determination of rigidity modulus of wire and moment of inertia of disc.
9. Determination of Band gap of semiconductor material.

MAJOR EQUIPMENTS / SOFTWARE REQUIRED

- Spectrometer
- Young's modulus apparatus
- Poiseuille's method apparatus
- Diode Laser
- Ultrasonic Interferrometer
- Air Wedge apparatus
- Torisional Pendulum Apparatus
- Bandgap determination kit

L: 0 T: 0 P: 30 Total:30 PERIODS

COURSE OUTCOMES

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

CO1 Experiment the concept of stress, strain for the given material.

CO2 Utilize the concept of interference and diffraction in optical measuring instruments.

CO3 Experiment the concept of diffraction in determining the wavelength, velocity of ultrasonic waves.

CO4 Grasp the knowledge of dependency of viscosity of a liquid on its density and velocity of liquid motion.

CO5 Apply the concept of temperature dependence of resistance of a semiconducting

16GE102	ENGINEERING PRACTICES LABORATORY	L	T	P	C
		0	0	4	2

LIST OF EXPERIMENTS

GROUP A (CIVIL & MECHANICAL) (30)

CIVIL ENGINEERING (12)

1. Study of plumbing tools and Components
2. Preparation of threads in pipes
3. Preparation of single and multi tap connections for domestic
4. Study of carpentry tools and its applications
5. Preparation of Cross Lap and Dove Tail Joints.

MECHANICAL ENGINEERING (18)

1. Study of different types of Welding and its applications
2. Preparation of Butt, Lap and Tee joints
3. Study of sheet metal and its applications
4. Preparation of Rectangular, Square Trays and Funnel
5. Demonstration of Lathe and Drilling Operations
6. Demonstration of Smithy and Foundry tools.

GROUP B (ELECTRICAL AND ELECTRONICS) (30)

ELECTRICAL ENGINEERING PRACTICE (18)

1. Residential house wiring using switches, fuse, miniature circuit breaker, 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 insulation resistance to earth of electrical equipment.
7. Measurement of single and three phase voltages.
8. Study of Iron Box, Emergency Lamp and Fan.

ELECTRONICS ENGINEERING PRACTICE (12)

1. Study of Electronic components and equipments –Resistor, colour coding, measurement of AC signal parameter (peak-peak, rms period, frequency) using CRO.
2. Verification 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. Characteristics of a PN Junction diode

MAJOR EQUIPMENTS / SOFTWARE REQUIRED

CIVIL

1 Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings.
2 Carpentry vice(fitted to workbench)
3 Standard wood working tools
4 Models of industrial trusses, door joints, furniture joints
5 Power Tools:
(a)Rotary Hammer
(b)Demolition Hammer
(c)Circular Saw
(d)Planer
(e)Hand Drilling Machine
(f)Jigsaw

MECHANICAL

1 Arc welding transformer with cables and holders
2 Welding booth with exhaust facility
3 Welding accessories like welding shield, chipping hammer, wire brush, etc.
4 Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.
5 Centre lathe
6 Hearth furnace, anvil and smithy tools
7 Moulding table, foundry tools
8 Power Tool: Angle Grinder
9 Study-purpose items: centrifugal pump, air-conditioner

ELECTRICAL

1 Assorted electrical components for house wiring
2 Electrical measuring instruments
3 Study purpose items: Iron box, fan and regulator, emergency lamp
4 Megger (250V/500V)
5 Power Tools:
(a) Range Finder
(b) Digital Live-wire detector

ELECTRONICS

1 Soldering guns
2 Assorted electronic components for making circuits
3 Small PCBs
4 Multi Meters
5 Study purpose items: Telephone, FM radio, low-voltage power supply
6 Bread Board
7 CRO

L : 0 T: 0 P: 60 Total:60 PERIODS

COURSE OUTCOMES

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

CO1 Demonstrate plumbing system and Carpentry for the required applications.
CO2 Relate the basic machining operations with engineering problems.
CO3 Apply different types of Welding processes and Sheet metal processes for the Industrial applications
CO4 Illustrate Residential House wiring and simple wiring circuits.
CO5 Employ knowledge on measuring electrical quantities and usage of energy meters.

16EN102	TECHNICAL ENGLISH II	L	T	P	C
	(Common to all B.E. / B. Tech. Courses)	3	0	0	3

UNIT I 9

Technical Vocabulary – meanings in context – Sentence pattern - Process description - Sequencing words - Uses of Pronouns - Paragraph writing – narrative.

UNIT II 9

Numerical adjective - Phrasal verbs - Phrases / Structures indicating use / purpose – Introduction to communication & Barriers to communication - Non-verbal communication – Different grammatical forms of the same word.

UNIT III 9

Stress and Intonation – Word stress & Sentence stress – Formal Letter writing- quotations, clarification, placing orders, complaint letter – Writing – Using connectives (discourse makers) - Recommendations -Report writing – types of report, report format, recommendations/suggestions- (Fire Accident & Road Accident).

UNIT IV 9

Direct & Indirect speech – Argumentative paragraphs – Letter of application – content, format (CV / Resume) –Checklist– E-mail communication – Blog writing.

UNIT V 9

Auxiliary verbs - Preparing Agenda, Notices and Minutes – Proposal writing – project/business proposal- Technical essay – Conversational skills – four types of speeches – extempore, manuscript, impromptu, memorized.

L :45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 Gunasekaran.S , ' Technical English II' Third Edition, Vishnu Prints Media, Chennai, 2016.
2. Dhanavel, S.P. English and Communication Skills for Students of Science and Engineering. Orient Blackswan, Chennai. 2011.

REFERENCES

1 Muralikrishna & Sunita Mishra. Communication Skills for Engineers. Pearson, New Delhi. 2011.
2 Smith-Worthington, Darlene & Sue Jefferson. Technical Writing for Success. Cengage, Mason USA. 2007.
3 Rizvi, Ashraf. M, Effective Technical Communication, Tata McGraw-Hill, New Delhi, 2005.
4 Mitra K. Barun, "Effective Technical Communication – A Guide for Scientists and Engineers", Oxford University Press, New Delhi, 2006.
5 Anderson, Paul V. Technical Communication: A Reader-Centered Approach. Cengage. New Delhi. 2008

COURSE OUTCOMES

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

CO1 Apply knowledge about the various principles of communication and its various stages.
CO2 Imply the importance of verbal and non-verbal communication in the professional world along with its uses.
CO3 Review the grammar – verbs and its different forms and application of the different forms of advanced grammar.
CO4 Apply grammatical knowledge which enhances speaking and writing skills to prepare reports and resume in a professional manner.
CO5 Speak clearly, confidently, comprehensively, and communicate with one or many listeners using appropriate communicative strategies.

16MA102	ENGINEERING MATHEMATICS II	L	T	P	C
	(Common to all B.E. / B. Tech. Courses)	3	1	0	4

UNIT I MULTIPLE INTEGRALS 9+3

Double integration in Cartesian co-ordinates – Change of order of integration – Triple Integrals – Simple problems – Area and volume by multiple integrals.

UNIT II VECTOR CALCULUS 9+3

Gradient Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs) – Simple problems involving cubes and rectangular parallelepipeds.

UNIT III COMPLEX DIFFERENTIATION 9+3

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 using Milne Thomson's method – Conformal mapping : w= z + c, cz, 1/z, and bilinear transformation.

UNIT IV COMPLEX INTEGRATION 9+3

Complex integration – Statement and Problems of Cauchy's integral theorem and Cauchy's integral formula – Taylor's and Laurent's expansion – Singular points – Residues – Residue theorem – Problems only.

UNIT V LAPLACE TRANSFORMS 9+3

Laplace transform – Conditions for existence (statement only) – Transforms of standard functions – Properties (statement only) – Transforms of derivatives and integrals – Initial and Final value theorems (statement only) – Periodic functions - Inverse transforms – Convolution theorems (statement only) – Applications of Laplace transforms for solving the ordinary differential equations up to second order with constant co-efficient.

L :45 T:15 P:0 Total: 60 PERIODS

TEXT BOOKS

1 Bali, N. P. and Manish Goyal, "Text book of Engineering Mathematics", 4th Edition, University Science Press, 2014.

2. Grewal, B.S., "Higher Engineering Mathematics", 43rd Edition, Khanna Publications, Delhi, 2014.

REFERENCES

1 Ramana, B.V., "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, 2014.

2 Kandasamy, P., Thilagavathy, K. and Gunavathy, K., "Engineering Mathematics", Volume I., S. Chand & Co., New Delhi, 2012.

3 Jain, R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", 4th Edition, Narosa Publishing House Pvt. Ltd., 2015.

4 Kreyszig, E., "Advanced Engineering Mathematics", 8th Edition, John Wiley & Sons, Inc, Singapore, 2008.

5 Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education Ltd., 2013.

COURSE OUTCOMES

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

CO1 Evaluate double integral and triple integral to compute area, volume for two dimensional and three dimensional solid structure.

CO2 Know the gradient, divergence and curl, related theorems useful for engineering applications.

CO3 Test the analyticity and to construct the analytic function and transform complex functions from one plane to another plane graphically.

CO4 Evaluate real and complex integrals over suitable closed paths or contours.

CO5 Know the Applications of Laplace transform and its properties & to solve certain linear differential equations using Laplace transform technique.

16PY102	PHYSICS OF MATERIALS	L	T	P	C
	(Common to All B.E. / B. Tech. Courses)	3	0	0	3

UNIT I CONDUCTING AND SUPERCONDUCTING MATERIALS 9

Classification of materials based on conductivity- Conductors –Quantum theory – Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals. Superconductors – Type I and Type II superconductors – BCS theory of superconductivity (Qualitative) –High T_c superconductors – Application of superconductors –SQUID, Magnetic levitation.

UNIT II SEMICONDUCTING MATERIALS 9

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

UNIT III MAGNETIC MATERIALS 9

Basic concepts – magnetic moment, susceptibility, permeability. Origin of magnetic moment – Bohr magneton – Dia, Para and Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – antiferromagnetic materials – Ferrites and its applications. Magnetic storage devices- magnetic hard disc, bubble memory.

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 – Applications of dielectric materials (capacitor and transformer) – ferroelectricity and applications.

UNIT V ADVANCED ENGINEERING MATERIALS 9

Metallic glasses: preparation, properties and applications. Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, applications – Nanomaterials: Properties –Top-down process: Ball milling method- Bottom –up process: Chemical vapour deposition method- Carbon Nanotubes- Preparation by pulsed laser deposition method, properties and applications.

L :45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 Charles Kittel, Introduction to Solid State Physics, Wiley Publications, 2006.
2 Ragavan V, "Materials Science and Engineering:, PHI Learning Private, 2012.

REFERENCES

1 Rajendran.V, Engineering Physics, Tata McGraw-Hill Publishing Company Limited, New Delhi.2009.
2 Neil W.Ashcroft, N.David Mermin, Solid state physics, Cengage Publication, 2011.
3 S.O.Pillai, Solid State Physics, New Age International, New Delhi, 2005.
4 William D.Callister, Material Science and Engineering, Wiley Publications, 2006.
5 Dr.G.Senthil kumar, Engineering Physics-II, VRB Publishers Pvt.Ltd. Chennai.(2013).

COURSE OUTCOMES :

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

CO1 Understand the properties and applications of conducting, super conducting materials
CO2 Identify the electrical properties of semiconducting materials.
CO3 Classify the magnetic materials based on the properties and employ it to act as an memory storage device.
CO4 Understand the various types of polarisation and applications of dielectric materials.
CO5 Comprehend the preparation and properties of advanced engineering materials for industrial applications.

16CH102 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C

(Common to All B.E. / B. Tech. Courses) **3 0 0 3**

UNIT I ENVIRONMENT & BIODIVERSITY 9

Definition, scope and introduction –planet earth (atmosphere, lithosphere & hydrosphere) of environment. Introduction to biodiversity definition: genetic, species and ecosystem diversity –Values of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values–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.

UNIT II AIR &NOISE POLLUTION 9

Air pollution - Atmospheric chemistry - Chemical composition of the atmosphere-Definition- causes, effects and control measures. Control of particulate and gaseous emission - Electrostatic precipitator – automobile emission - catalytic convertor - Acid rain- Green house effect - Global warming- -Air (Prevention & control of pollution act) - Noise pollution – Definition, effects & control of noise pollution.

UNIT III WATER & SOIL POLLUTION 9

Water and their environment significance-Water quality parameters-Physical, chemical and biological parameters-Dissolved Oxygen-Biological Oxygen demand – Chemical Oxygen Demand (Definition only) - Water pollution- causes, effect & control measures-Sewage water treatment – Water (prevention & control of pollution act) - Soil pollution-Definition, causes, effects of soil pollution

UNIT IV CONVENTIONAL & NON CONVENTIONAL ENERGY RESOURCES 9

Conventional – Coal – Gross net calorific value (Definition only) – Coke – Manufacture of coke – Otto Hoffmann method – Petroleum- Fractional distillation - Natural gas - LPG and CNG-Need for alternative energy resources –Nuclear energy-Fission and fusion reactions- Light water nuclear reactor for power generation (block diagram only) – Solar energy – Wind energy-H_2O_2 fuel cell. Role of an individual in conservation of energy resources

UNIT V GREEN CHEMISTRY & ENVIRONMENTAL MANAGEMENT 9

Green chemistry- Principles of green chemistry – Water conservation – Rain water harvesting - Solid waste management: causes, effects and control measures of municipal solid wastes. Disaster management – Floods, Earthquake – Population growth – Population explosion and its consequences - Role of information technology in environment and human health.

L :45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 Dr.A.Ravikrishnan, “Environmental Science & Engineering”Sri Krishna Hitech Pub.Co.Pvt.Ltd.2013

2 Benny Joseph, “Environmental Science & Engineering” Tate McGraw-Hill Pub.Co.Ltd, New Delhi.2009.

REFERENCES

1 G.Tyler Miller, “Environmental Science” Cengage Learning India Pvt. Ltd. New Delhi.2011

2 Dr. Debang Solanki, “Principles of Environmental Chemistry” Prateeksha Pub.Jaipur.2011.

3 Gilbert M. Masters and Wendell. P.Ela, “Introduction to Environmental Engineering and Science” PHI Learning Pvt. Ltd. New Delhi.2010

4 Deeksha Dave and S.S. Katewa, “Environmental Science & Engineering” Learning India Pvt. Ltd. New Delhi.2011

5 Benny Joseph “Environmental Science & Engineering” Tata McGraw-Hill Pub.Co.Ltd, New Delhi. 2009.

COURSE OUTCOMES :

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

CO1 Understand the importance of fossil fuels as energy sources, development of alternative sources of energy like solar, wind etc

CO2 Aware on green house effect, various types of pollutions and global warming

CO3 Know about the effects of automobile emission and its control measures

CO4 Gain knowledge about the protection of environment

CO5 Conscious on water conservation, rapid growth of population and advantages of green chemistry

16EE102	ELECTRIC CIRCUIT ANALYSIS (Common to EEE,EIE,BME)	L 4	T 0	P 0	C 4

UNIT I BASIC CIRCUITS ANALYSIS 12

Ohm's Law – Kirchoffs laws – DC and AC Circuits: Peak value, Average value, Effective value (RMS) – Independent and Dependent voltage and current sources -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 CIRCUITS 12

Network reduction: voltage and current division, source transformation – star delta conversion, Thevenin's and Norton's Theorem – Superposition Theorem – Maximum power transfer theorem – Reciprocity theorem

UNIT III RESONANCE AND COUPLED CIRCUITS 12

Series resonance – frequency response – Quality factor and Bandwidth – Parallel Resonance (RL & RC circuit only) - Self and mutual inductance – Coefficient of coupling - Single tuned circuits.

UNIT IV TRANSIENT RESPONSE FOR DC and AC CIRCUITS 12

Transient response of RL, RC and RLC series circuits using Laplace transform for DC input – Transient response of RLC series circuit for sinusoidal input.

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 & un balanced – phasor diagram of voltages and currents.

L : 60 T: 0 P: 0 Total: 60 PERIODS

TEXT BOOKS

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", Tata McGraw Hill publishers, 6th edition, New Delhi, (2002)
2. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", Tata McGraw Hill, (2010)

REFERENCES

1. Paranjothi SR, "Electric Circuits Analysis," New Age International Ltd., New Delhi, (1996)
2. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, Tata McGraw- Hill, New Delhi (2001)
3. Charles K. Alexander, Mathew N.O. Sadik, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, (2003)
4. Chakrabati A, "Circuits Theory Analysis and synthesis , Dhanpath Rai & Sons, New Delhi, (1999)
5. Arumugam & M.Prem Kumaran, "Electric Circuit Theory", Khanna Publishers, New Delhi, 2003

COURSE OUTCOMES

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

CO1 Apply the elementary concept of electric sources, elements and their properties in the circuits
CO2 Design electrical circuits, analyse and interpret data using mathematical tools
CO3 Calculate the electrical parameters in any practical circuits.
CO4 Analyze three phase AC circuits
CO5 Gain knowledge of DC resonance and transients circuits.

16ME104	ENGINEERING GRAPHICS	L	T	P	C
	(Common to CSE, ECE, EEE, EIE, IT and BIO)	3	0	2	4

UNIT I PROJECTION OF POINTS, LINES AND PLANE SURFACES 9+6

Projection of points, Projection of 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 II PROJECTION OF SOLIDS 9+6

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 III SECTION OF SOLIDS 9+6

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.

UNIT IV ISOMETRIC PROJECTIONS & FREE HAND SKETCHING 9+6

Principles of isometric projection – isometric scale – isometric drawings of simple solids, truncated prisms, pyramids, cylinders and cones.

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 V BUILDING DRAWING 9+6

Drawing of a plan, Elevation and sectioning of security room and residential building (Two bed rooms, kitchen, hall, etc.)

L : 45 T: 0 P: 30 Total: 75 PERIODS

TEXT BOOKS

1 N.D. Bhatt and V.M. Panchal, "Engineering Drawing" Charotar Publishing House, 53rd Edition, (2016).

2 K. R. Gopalakrishnan, "Engineering Drawing" (Vol.I & II), Subhas Publications (2014).

REFERENCES

1 K. V. Natarajan, "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai (2016).

2 M.S. Kumar, "Engineering Graphics", D.D. Publications, (2016).

3 M.B. Shah and B.C. Rana, "Engineering Drawing", Pearson Education (2015).

4 CADD Centre, Solid Edge, Reference Guide 14, 2015.

COURSE OUTCOMES

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

CO1 Draw projections of points, straight lines and plane surfaces.

CO2 Illustrate top view and front view of the solids.

CO3 Outline Sectioned Views of the solids.

CO4 Exhibit knowledge about isometric, perspective and orthographic projections.

CO5 Design simple residential and office buildings**.**

16GE112	CAREER DEVELOPMENT PROGRAMME - II	L	T	P	C
	(Common to All B.E. / B. Tech. Courses)	1	0	2	2*

UNIT I LINGUISTIC SKILLS II **15**

Goal Settings, Insights into pre-placement requisites, SWOT Analysis, LSRW Skills

UNIT II QUANTITATIVE ABILITY III **8**

Time, speed and distance -Train problems-Boats and streams, Time and work – Pipes and cisterns, Calendars, Venn diagram.

UNIT III QUANTITATIVE ABILITY IV **7**

Probability, Permutation &Combination, Mixtures & Allegation, Mensuration, Data Interpretation.

UNIT IV PERSONALITY DEVELOPMENT **8**

Personality, Presentation Skills – stages, selection of topic, content & aids, Minutes of meeting, Public speaking.

UNIT V COMMUNICATION SKILLS **7**

Power point presentation, Speak for three minutes, Online typing, Passage reading.

L :15 T: 0 P: 30 T: 45 PERIODS

TEXT BOOKS

1. John Eastwood, "Oxford Practice Grammar", Oxford, 2006.
2. Rajesh Varma, "Fast Track Objective Arithmetic", Arihant Publications, 2010.

REFERENCES

1. R.V.Praveen, "Quantitative Aptitude and Reasoning" PHI Publication, 2012.
2. R.S.Agarwal, "Quantitative Aptitude for Competitive Examinations", S.Chand & Company Pvt Limited, 2016.
3. Barun K. Mithra, 2014, "Personality Development & Soft Skills", Oxford.
4. Arun Sharma - Quantitative Aptitude for CAT.
5. Dr. Rishipal and Dr. Jyoti Sheoran "Business Communication", SPD Publisher, 2014.

COURSE OUTCOMES

At the end of the course students should be able to

CO1 Understand the field Linguistic techniques.
CO2 Communicate at the basic level in public speaking and write reports.
CO3 Solve time related problems.
CO4 Get the critical concepts through the mixture & allegation & data interpretation sums.
CO5 Write minutes of meeting and versatile presentations.

16ME111 CAREER DEVELOPMENT PROGRAMME II (Python)

L	T	P	C
1	0	2	2*

UNIT I INTRODUCTION TO PYTHON, CONTROL STRUCTURES 5+10

Introduction to python- Python Basis- Python Data Variables & Operators: id() and type() functions- Coding Standards.

Looping and Control Structures: Selection: if else- elif, Nested if. Iteration Control structures-Break, Continue & Pass. Repetition: while, for, Nested for.

UNIT II COLLECTIONS, FUNCTIONS 5+10

Collections: Strings- Tuples- Lists- Sets &Dictionary, Sorting.

Functions: Defining & Calling a function- Passing arguments to functions - Mutable & Immutable Data Types- Different types of arguments- Scope of variables, Recursive Function, Example Program.

UNIT III MODULES, PACKAGES, FILES AND EXCEPTION HANDLING 5+10

Modules and Package: Modules, Package, Example Programs.

File and Exception Handling: Text files, reading and writing files, format operator; try…except--try…finally.

L :15 T: 0 P: 30 Total: 45 PERIODS

TEXT BOOKS

1 Allen B. Downey, "Think Python: How to Think Like a Computer Scientist‘‘, 2nd edition, Updated for Python 3, Shroff/O‘Reilly Publishers, 2016

2 Harsh Bhasin "Python for Beginners", New Age International Publishers, 2016.

REFERENCES

1 R. Nageswara Rao "Core Python Programming", Second edition, Dream Tech Publishers, 2018.

2 Roberto Tamassia, Michael H. Goldwasser "Data Structures and Algorithms in Python", Wiley Publishers, 2016.

3 Guttag John V. "Introduction to Computation and Programming Using Python with Application to Understanding Data", Second edition, MT Tech Publishers, 2018.

COURSE OUTCOMES

At the end of the course students should be able to

CO1 learn and understand Python programming basics and paradigm

CO2 learn and understand python looping, control statements and string manipulations.

CO3 learn and know the concepts of file handling, exception handling and database connectivity

16CH103	CHEMISTRY LABORATORY	L	T	P	C
	(Common to All B.E. / B. Tech. Courses)	0	0	2	1

LIST OF EXPERIMENTS

1. Estimation of hardness of Water by EDTA.
2. Determination of DO in water (Winkler's method)
3. Estimation of Chloride in Water sample (Argentometric).
4. Conductometric titration (Simple acid base).
5. Conductometric titration (Mixture of weak and strong acids vs strong base).
6. Potentiometric Titration (Fe^{2+} / $KMnO_4$ or $K_2Cr_2O_7$).
7. pH titration (acid & base).
8. Determination of inhibitor efficiency on the corrosion rate of steel in acid media by weight loss method.
9. Anodizing of aluminum and determination of thickness of anodic film.
10. Determination of cathode efficiency of nickel plating.

MAJOR EQUIPMENTS / SOFTWARE REQUIRED

- Electronic balance
- pH meter
- Potentiometer
- Conductivity bridge
- Spectro Photometer
- Colorimeter
- IC regulated power supply
- Hot air oven

L : 30 T: 0 P: 0 Total: 30 PERIODS

COURSE OUTCOMES

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

CO1 Gain the experimental knowledge of testing the water.

CO2 Carry out titration using conductivity meter, potentiometer and pH meter.

CO3 Estimate the metal ions in industrial effluents.

CO4 Set up mini electroplating unit.

CO5 Determine the inhibitor efficiency on the corrosion rate of steel.

16EN103	COMMUNICATION SKILLS LABORATORY	L	T	P	C
	(Common to all B.E. / B. Tech. Courses)	0	0	4	2

UNIT I LISTENING 15

Introduction to Business communication-Listening to Monologues-Listening for general content-Listening to dialogues-Listening to telephonic Conversation-Listening to conversation among three or more people-Listening to business conversations.

UNIT II SPEAKING 15

Greetings, Formal and in formal introduction of self and others – Establishing business relationships and negotiating-Tongue twisters/pronunciation drills – Describing an object or event-Describing a working mechanism- Phrases for positive feedback, agreeing/disagreeing Group Discussion-Conversation techniques –Presentation skills-Interview techniques.

UNIT III READING 10

Reading Techniques-Reading to understand –Facts, Inference, Main idea, Authors opinion and tone – Newspaper reading, Reading brochures- Reading and reviewing books, articles -Cloze exercises-Reading Comprehension-Reading a Technical Report-Critical Reading(Editorial):Creative and Critical Thinking.

UNIT IV WRITING 15

Business Itinerary – Business Letters – Calling for Quotation-Placing Orders-Letter Seeking clarification- Letter requesting Information, explaining a situation- Resume & cover letter, Short prepared compositions on current affairs – Leaflets, Instruction Manual- Picture Perception-Encoding and decoding advertisements-Perceiving Visual Information-E-mail Etiquette and Correspondence-Expression indicating frequency/responding to situations and Providing solutions.

UNIT V SOFT SKILLS 5

Emotional Intelligence- Inter & Intrapersonal skills-Teamwork/ Leadership skills -Decision making and Problem solving skills -Time & Stress management- Professional Ethics.

L : 0 T: 0 P:60 Total: 60 PERIODS

TEXT BOOKS

1. Norman Whitby, Business Benchmark, Cambridge English, Second Edition, South Asian Edition 2014
2. Guy Brook-Hart, Business Benchmark, Cambridge English, Second Edition, South Asian Edition 2014

REFERENCES

1. Adrian Doff, Craig Thaine, Herbert Puchta, Jeff Stranks, Peter Lewis-Jones, "Empower English", Cambridge University Press, NY, USA. Updated Edition, 2016.
2. Rizvi, Ashraf. M. "Effective Technical Communication". Tata McGraw-Hill, New Delhi. Updated Edition, 2015.
3. Department of English, Anna University, "Mindscapes: English for Technologists and Engineers",Chennai, Updated Edition, 2015.
4. Leo Jones, Richard Alexander, "New International Business English", Cambridge University Press, NY, USA. Updated Edition, 2009.
5. Jeff Butterfield, "Soft skills for everyone", Cengage Learning, New Delhi, 2011.

COURSE OUTCOMES

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

- **CO1** Face the challenges of the globalized world with confidence and with the best communicative skills.
- **CO2** Make learners imbibe listening and speaking skills in both formal and informal contexts.
- **CO3** Help them develop their reading skills by familiarizing them with different types of reading strategies.
- **CO4** Make them acquire language skills at their own pace by using e-materials and language lab components.
- **CO5** Enrich their creative and critical thinking and get through interviews successfully.

16EE103	ELECTRIC CIRCUITS LABORATORY (Common to EEE, BME & EIE)	L	T	P	C
		0	0	2	1

LIST OF EXPERIMENTS

1. Verification of ohm's laws and kirchoff's laws
2. Verification of mesh and nodal analysis
3. Verification of Thevenin's and Norton's Theorem
4. Verification of superposition Theorem
5. Verification of maximum power transfer Theorem
6. Verification of reciprocity theorem
7. Measurement of self inductance of a coil
8. Transient response of RL and RC circuits for DC input.
9. Frequency response of series and parallel resonance circuits
10. Measurement of various signals using CRO

MAJOR EQUIPMENTS / SOFTWARE REQUIRED

Hardware

- C.R.O
- D.C Power Supply(regulated)
- Function Generator

L : 0 T: 0 P:30 Total:30 PERIODS

COURSE OUTCOMES

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

CO1 Understand the operation of electric circuits

CO2 Understand the concepts of various theorems on DC Circuits

CO3 Gain knowledge about resonance

CO4 Gain knowledge on inductance of a coil

CO5 Acquire the concepts of transients in electrical systems

16MA201	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	L	T	P	C
	(Common to all B.E. / B. Tech. Courses)	3	1	0	4

UNIT I FOURIER SERIES 9+3

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

UNIT II FOURIER TRANSFORMS 9+3

Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem– Parseval's identity.

UNIT III PARTIAL DIFFERENTIAL EQUATIONS 9+3

Formation of partial differential equations – Lagrange's linear equation –Solution of standard types of first order partial differential equations – Linear partial differential equations of second order with constant coefficients (Homogeneous Problems).

UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9+3

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 9+3

Z- Transforms – Elementary properties – Inverse Z - Transform – Convolution theorem – Formation of difference equation – Solution of difference equations using Z - Transform.

L:45 T:15 P: 0 Total: 60 PERIODS

TEXT BOOKS

1. Grewal, B.S., "Higher Engineering Mathematics", 43rd Edition, Khanna Publications, Delhi, 2014.
2. Ramana, B.V., "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, 2014.

REFERENCES

1. Bali, N.P. and Manish Goyal, "A Textbook of Engineering Mathematics", Fifth Edition, Laxmi Publications (P) Ltd., 2014.
2. Glyn James, "Advanced Modern Engineering Mathematics", Fourth Edition, Pearson Education, 2013.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", Tenth Edition, Wiley India, 2015.
4. Ronald Bracewell, "The Fourier transforms & its Applications" 3rd Edition, 2012.
5. Zachmanoglou, E.C., "Introduction to partial differential Equations with Application", 2012.

COURSE OUTCOMES

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

CO1 Know how to find the Fourier Series and half range Fourier Series of a function given explicitly or to find Fourier Series of numerical data using harmonic analysis.

CO2 Find the Fourier transform, sine and cosine transform of certain functions and use Parseval's identity to evaluate integrals.

CO3 Form partial differential equations and solve certain types of partial differential equations.

CO4 Solve one dimensional wave equation, one dimensional heat equation and two dimensional heat equation in steady state using Fourier Series.

CO5 Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.

16IT206	DATA STRUCTURES AND ALGORITHMS	L	T	P	C
	(Common to EEE, ECE & EIE)	3	0	0	3

UNIT I LINEAR STRUCTURES 9

Abstract Data Types (ADT)-List ADT-Array, Linked List and Cursor Implementations of List ADT-Linked Lists and its Types- Stack ADT-Queue ADT -Application of List, Stack and Queue.

UNIT II TREE STRUCTURES 9

Tree ADT-Tree Traversals: In-order traversal- Pre-order traversal - Post order traversal -Binary Tree ADT- -Applications of Trees - Binary Search Tree ADT- AVL Trees-AVL Tree Rotations – Huffman Tree-Binary Heaps

UNIT III GRAPHS 9

Definitions - Topological Sort-Breadth First Traversal- Depth First Traversal – Dijkstra's Shortest Path Algorithm - Minimum Spanning Tree - Prim's and Kruskal's Algorithms - Floyd's Algorithm-Applications of Graphs

UNIT IV INDEXING AND SORTING 9

Hashing: Separate Chaining - Open Addressing - Linear Probing – Sorting: Bubble Sort -Insertion Sort - Heap Sort - Merge Sort - Shell Sort - Quick Sort

UNIT V ALGORITHM DESIGN AND ANALYSIS 9

Algorithm Analysis- Asymptotic Notations- Greedy Algorithms (Prim's algorithm) - Divide and Conquer(Merge sort) - Dynamic Programming (Floyd's Algorithm) - Backtracking (8 Queens problem) – Branch and Bound (Travelling Salesman Problem) – NP Complete Problems (Graph coloring problem)

L : 45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 A. V. Aho, J. E. Hopcroft, and J. D. Ullman, "Data Structures and Algorithms", Pearson Education, 2nd Edition, 2007

2 M.A.Weiss ,"Data Structures and Algorithm Analysis in C", Pearson Education, 2nd Edition, 2005.

REFERENCES

1 Tremblay Jean Paul and Sorenson Paul G, "An introduction to data structures with applications", Tata McGraw-Hill, 2nd Edition, 2007

2 R.F.Gilberg and B.A.Forouzan, "Data Structures: A Pseudocode Approach with C",Thomson India Edition, 2nd Edition, 2005

3 Sara Baase and A.Van Gelder, "Computer Algorithms", Pearson Education, 3rd Edition,2003

4 T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein, "Introduction to Algorithms",Prentice Hall of India Ltd, 2nd Edition, 2001

5 A. M. Tenenbaum, Y. Langsam and M. J. Augenstein, "Data Structures using C", Pearson Education, 2nd Edition, 1998

COURSE OUTCOMES

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

CO1 Design linear and non linear data structures in align with real time problems

CO2 Analyze the real time problems

CO3 Differentiate tractable and intractable problems

CO4 Understand memory allocation and retrieval methodologies

CO5 Apply various algorithm design techniques for problem solving.

16EE202	ELECTRONIC DEVICES AND CIRCUITS	L	T	P	C
	(Common to EEE,EIE,BME, CSE & IT)	3	0	0	3

UNIT I PN JUNCTION DEVICES 9

Overview of Semiconductors – PN junction diode : Structure, Operation and V-I Characteristics, Diffusion and Transition capacitance, Zener diode – Characteristics – Diode Applications : Rectifiers, Clipper and Clamper. LED, Laser diode, Photodiode - PV Cells

UNITII TRANSISTORS 9

BJT- JFET - MOSFET – Structure, Operation, Characteristics and Biasing. UJT, SCR, TRIAC: Structure and Characteristics. Photo transistor - Opto-isolators.

UNIT III SMALL SIGNAL AMPLIFIERS 9

BJT small signal model – Analysis of CE, CB, CC amplifiers – Gain and frequency response. Multistage Amplifiers – Cascade connection, Darlington connection – Differential amplifier : Dual input balanced output – Common mode and differential mode analysis. (Qualitative Treatment only)

UNIT IV POWER AMPLIFIERS AND SWITCHING CIRCUITS 9

Transformer coupled Class A, Class B push pull, Class AB push pull & Class C amplifiers – crossover distortion. Multivibrator – Monostable, astable and bistable multivibrator – Schmitt triggers.

UNIT V FEEDBACK AMPLIFIERS AND OSCILLATORS 9

Advantages of negative feedback – voltage / current-series /shunt feedback –positive Feedback – Condition for oscillations, phase shift – Wien bridge, Hartley, Colpitts and Crystal oscillators.

L : 45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 David A. Bell , “Electronic Devices and Circuits”, Prentice Hall of India, 5th Edition, 2008.

2. Jacob Millman, Christo C Halkies and Sathyabarath Jit “Electronic Devices and Circuits”, Tata McGraw Hill, 2008.

REFERENCES

1 Floyd, “Electronic Devices” Pearson Asia 7th Edition, 2009.

2 Vinoth Kumar Khanna, “Insulated Gate Bipolar Transistor IGBT Theory and Design”, Wiley-IEEE Press, 2004.

3 Donald A Neamen, “Electronic Circuit Analysis and Design” Tata McGraw Hill, 3rd Edition, 2006

4 S.Poornachandra, B.Sasikala, “Electronic Devices and Circuits”, Scitech Publications India, (P) Ltd, Chennai, 2010.

5 Salivahanan.S, Vallavaraj.A and Kumar.N.S, “Electronic Devices and Circuits” Tata McGraw Hill, 2012.

COURSE OUTCOMES

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

CO1 Explain the structure of the basic electronic devices

CO2 Analyze the switching characteristics of transistors

CO3 Model the different configuration of Small signal amplifier

CO4 Construct the power amplifiers and switching circuits

CO5 Design the applications of electronic gadgets using the basic electronic devices

16EE203	LINEAR AND DIGITAL CIRCUITS (Common to EEE, ECE & EIE)	L	T	P	C
		3	0	0	3

UNIT I OPERATIONALAMPLIFIER 9

Ideal OPAMP characteristics, DC performance characteristics, Basic applications of OPAMP-Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, adder, subtractor, Integrator, Differentiator

UNITII APPLICATIONS OF OPAMP AND TIMER ICS 9

Instrumentation amplifier, Waveform generators, clipper and clamper, peak detector, S/H circuit, D/A converter (R-2R Ladder type, weighted resistor type), A/D converters using OP AMP (Flash type, Successive approximation type, Dual slope type) IC 555 Timer circuit, Functional block, Characteristics & applications

UNIT III MINIMIZATION TECHNIQUES AND GATES 9

Boolean Algebra, Postulates and Laws , De-morgan's theorem, Principle of Duality, SOP, POS , K-Map , Tabulation Method, Don't Care Conditions. **Digital Logic Gates**: Logic Gates , NAND, NOR Implementation

UNIT IV COMBINATIONAL AND SEQUENTIAL CIRCUITS 9

Adders , Subtractors , Multiplexer , Demultiplexer , Encoder, Decoder , Design of Combinational Circuits: Code Converters - Binary to Gray, Gray to Binary, Excess3 to BCD, BCD to Excess 3, 2 bit Magnitude Comparator.

SR Latch, Flip Flops: SR , JK , D ,T - Characteristic Table and Equation - Edge and Level Triggering.

UNIT V SEQUENTIAL CIRCUITS 9

Types of sequential circuits, **Synchronous Sequential Circuits:** Design**:** Design Procedures**,** Synchronous and Asynchronous Counters, Modulo–n Counters, 3 Bit Up/Down Counter, Shift Registers: SISO, SIPO, PIPO, PISO. Analysis: Moore and Mealy Models, State Diagram, State Table, State Reduction, State Assignment.

L : 45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 D.Roy Choudhry, Shail Jain, "Linear Integrated Circuits", New Age International Pvt. Ltd., 2000.
2. M. Morris Mano, "Digital Design", 4th Edition, Prentice Hall of India Pvt. Ltd., 2008

REFERENCES

1 Gray and Meyer, "Analysis and Design of Analog Integrated Circuits",Wiley International, 2005.
2 Ramakant A.Gayakwad, "OP-AMP and Linear ICs", Prentice Hall / Pearson Education,4th Edition, 2001.
3 S.Salivahanan and S. Arivazhagan, "Digital Circuits and Design", 3rd Edition, Vikas Publishing House Pvt. Ltd, New Delhi, 2006.
4 Charles H.Roth. "Fundamentals of Logic Design", 6th edition, Thomson Learning, 2013.
5 John.M Yarbrough, "Digital Logic Applications and Design", Thomson Learning, 2006.

COURSE OUTCOMES

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

CO1 Understand the basic concepts in the design of electronic circuits using linear integrated circuits
CO2 Analyze and troubleshoot analog ICs in various applications
CO3 Understand basic minimization techniques and logic gates.
CO4 Design and implement combinational circuits and Flip flops
CO5 Design and analyze sequential circuits.

16EI201	MEASUREMENTS AND INSTRUMENTATION (Common to EEE & EIE)	L	T	P	C
		3	0	0	3

UNIT I MEASUREMENT OF VOLTAGE AND CURRENT 9

Functional Elements of a Measuring Instrument – Static and Dynamic Characteristics – Standards and Calibration – Galvanometers: D'Arsonval and Vibration Galvanometer – Principle, Construction, Operation and Comparison of Moving Coil, Moving Iron Meters – Extension of Range and Calibration of Voltmeter and Ammeter.

UNIT II MEASUREMENT OF POWER, ENERGY AND MAGNETIC MEASUREMENT 9

Electrodynamometer type Wattmeter - LPF wattmeter - Phantom loading - Induction type energy meter - Magnetic measurements - Determination of B-H curve and measurement of iron loss.

UNIT III POTENTIOMETERS AND INSTRUMENT TRANSFORMERS 9

DC Potentiometer: Basic circuit, Standardization - Laboratory type (Crompton‟s) - AC potentiometer- Drysdale (Polar) type - Gall-Tinsley (Coordinate) type - Limitations and applications - Instrument Transformer: CT and PT construction and operation.

UNIT IV RESISTANCE AND IMPEDANCE MEASUREMENT 9

MEASUREMENT OF RESISTANCE: DC Bridges: Kelvin double bridge, Wheatstone bridge, Direct deflection method and Mega ohm Bridge method - Megger. Measurement of Impedance: AC Bridges: Maxwell's Bridge, Wein bridge, Schering bridge, Anderson bridge.

UNIT V STORAGE AND DISPLAY DEVICES 9

Magnetic disk and tape - Recorders, digital plotters and printers, CRT display, DSO, LED, LCD and dot matrix display - Data Logger.

L : 45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1. E. W. Golding and F. C. Widdis, "Electrical Measurements & Measuring Instruments", A. H. Wheeler & Co., 2001.
2. A. K. Sawhney, "A Course in Electrical & Electronic Measurements & Instrumentation", Dhanpat Rai & CO., New Delhi, 2010

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. Martin U. Reissland, "Electrical Measurement – Fundamental Concepts and Applications", NewAge International (P) Ltd., 2001
4. H. S. Kalsi, "Electronic Instrumentation", Tata McGraw-Hill, New Delhi, 2010
5. M. M. S. Anand, "Electronics Instruments and Instrumentation Technology", Prentice Hall India, New Delhi, 2009

COURSE OUTCOMES

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

- **CO1** Acquire knowledge about various meters used for measuring current and voltage and the characteristics of instrumentation system
- **CO2** Acquire knowledge about the techniques of power, energy and magnetic measurements
- **CO3** Understand about the functionalities and applications of potentiometers and instrument transformers
- **CO4** Understand about the various methodologies used to measure resistance, inductance and capacitance
- **CO5** Attain knowledge in storage and display devices

16EI202	ELECTRICAL MACHINES (Qualitative treatment only)	L	T	P	C
		3	0	0	3

UNIT I DC MACHINES 9

Construction of D.C. Machines – Principle and theory of operation of D.C. generator – EMF equation – Methods of excitation – Characteristics of D.C. generators-Applications. Principle of operation of D.C. motor - Back emf – Voltage equation-Torque equation-Types of D.C.motors and their characteristics – Starters– Speed control of D.C series and shunt motors-Applications

UNIT II TRANSFORMERS 9

Constructional details – Principle of operation-EMF Equation - Transformer on no load and load – Phasor diagram - Effect of resistance and leakage reactance of windings - Equivalent circuit

UNIT III SYNCHRONOUS MACHINES 9

Synchronous Machines-Constructional details-Synchronous generator-Principle of operation-Types-Equation of induced emf - Synchronous motor - Principle of operation-Hunting - Starting methods-Applications.

UNIT IV THREE PHASE INDUCTION MOTORS 9

Constructional details – Types of rotors – Principle of operation – Slip – Torque equation – Torque slip characteristics – Condition for maximum torque –Starters - Speed control - Applications.

UNIT V SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES 9

Constructional details of single phase induction motor– Principle of operation – Starting methods – Speed torque characteristics – Shaded pole motor – Stepper motors – Universal motor – Brushless DC motor- Servo motors-Applications.

L : 45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 Nagrath, I.J., and Kothari, D.P., "Electrical Machines", Tata McGraw - Hill, 2010

2 Theraja, B.L., "A Text book of Electrical Technology", Vol.II, S.C Chand and Co., New Delhi, 2012

REFERENCES

1 Del Toro.V, "Electrical Engineering Fundamentals", Prentice Hall of India, New Delhi, 1995

2 Cotton. H, "Advanced Electrical Technology", Sir Isaac Pitman and Sons Ltd., London, 1999

3 Fitzgerald A.E, Kingsley C., Umans, S. and Umans S.D., "Electric Machinery", McGraw-Hill, Singapore, 2000

4 Deshpande M. V., "Electrical Machines" PHI Learning Pvt. Ltd., New Delhi,2011

5 Sarma. M.S and Pathak.M.K.., "Electric Machines", Cengage Learning, 2012

COURSE OUTCOMES

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

CO1 Analyze and describe aspects of the construction, principle of operation, applications and methods of speed control of DC motors

CO2 Describe the construction, application and operation of transformers

CO3 Acquire knowledge on constructional details and principle of operation of Synchronous motors

CO4 Describe the construction, operation and characteristics of Induction motors

CO5 Identify suitable motors for industrial applications

16GE211	CAREER DEVELOPMENT PROGRAMME - III	L	T	P	C
	(Common to All B.E. / B. Tech. Courses)	1	0	2	2*

UNIT I PERSONALITY DEVELOPMENT & SOFT SKILLS 8

Body Language – Introduction, Grooming, Postures and Gestures, Dressing Etiquettes, Hygiene & Cleanliness, Time Management. Resume Building – Introduction, difference between Resume and CV, Strategy of resume writing Body of the resume, Clarity and Crispness, Format and Content, Code of Conduct.

UNIT II LINGUISTIC SKILLS III 15

Synonyms & Antonyms, Error Spotting, Paragraph Writing, Word Substitution, Jumbled words, Spellings, Dialogue Writing, Presentation.

UNIT III VERBAL REASONING I 8

Analytical reasoning - Linear, Circular & Complex arrangement, Blood relation, Direction Problems.

UNIT IV VERBAL REASONING II 7

Logical reasoning – Number and Alpha series, Odd man out, Element series, Logical series, Coding and
decoding, Syllogisms, Alphabets.

UNIT V PRACTICALS 7

Extempore speech, Online typing, Mock Interview, Case based interview, Passage writing.

L :15 T: 0 P: 30 Total: 45 PERIODS

TEXT BOOKS

1 Barun K. Mithra, "Personality Development & Soft Skills", Oxford, 2006.
2 S.P.Bakshi, "Objective English" Arihant Publications, 2014.

REFERENCES

1 R.V.Praveen, "Quantitative Aptitude and Reasoning" PHI Publication, 2013.
2 John Eastwood, "Oxford Practice Grammar", Oxford, 2006.
3 Barun K. Mithra, 2015, "Personality Development & Soft Skills", Oxford.
4 Arun Sharma - Quantitative Aptitude for CAT.
5 Dr. Rishipal and Dr. Jyoti Sheoran "Business Communication", SPD Publisher, 2014.

COURSE OUTCOMES

At the end of the course students should be able to

CO1 Improves their personality through non-verbal communication and write good resume.
CO2 Write sentences and dialogues through paragraph & dialogue writing.
CO3 Apply their analytical thinking.
CO4 Think logically in critical situations.
CO5 Face the interviews confidently through attending the mock interview sessions.

16GE213	CAREER DEVELOPMENT PROGRAMME - III	L	T	P	C
	(Common to All B.E. / B. Tech. Courses)	1	0	2	2*

UNIT I LINGUISTIC SKILLS I 8

Parts of speech, Transformation of sentences-simple, complex, compound, Homonyms, Question tags.

UNIT II LINGUISTIC SKILLS II 15

Synonyms, Antonyms, Cloze Test, Voice, Idioms & Phrases. Verbal Analogies.

UNIT III VERBAL ABILITY I 8

Logical sequence of words, Jumbled Words, Spellings, One word substitution.

UNIT IV VERBAL ABILITY II 7

Comparison, Paragraph formation, Error spotting

UNIT V VERBAL ABILITY III 7

Comprehension-comprehend and understand a passage, Dialogue Writing, Power point Presentation.

L :15 T: 0 P: 30 Total: 45 PERIODS

TEXT BOOKS

1. Dr. Aggarwal R.S and Monika Agarwal, "Objective General English", New Delhi, Sultan Chand and Company Ltd., 1999.
2. Arun Sharma & Meenakshi Upadhay," Verbal ability and Reading comprehension". Mc Graw Hill Education.

REFERENCES

1. Aptimithra , McGraw Hill Publications, 2012.
2. Ajaysingh, Verbal ability and Reading comprehension", Arihant publication.
3. Hedge, T. (2000). Teaching and learning in the language classroom. Oxford, Oxford University Press.
4. Dutt Kiranmai.P, Rajeevan Geethe & Prakash C.L.N 'A course in Communication Skills ,First publications Cambridge University Press India Pvt.Ltd , 2008.
5. Brown, D. (1995). Teaching by Principles-An Interactive Approach to Language Pedagogy. Prentice Hall.

COURSE OUTCOMES

At the end of the course students should be able to

CO1 Understand the importance & fundamentals of communication.

CO2 Start speaking and writing in English without making any mistakes.

CO3 Develop presentation skills.

CO4 Think logically in critical situations.

CO5 Prepare the questionnaire.

16IT207 DATA STRUCTURES AND ALGORITHMS LABORATORY **L T P C**

0 0 2 1

(Common to ECE, EEE & EIE)

LIST OF EXPERIMENTS

1. Implement List ADT using Array
2. Construct Singly Linked List
3. Doubly Linked List Implementation
4. Implementation of Stack ADT (Using Linked List)
5. Implementation of Queue ADT (Using Array)
6. Implementation of Heap Sort
7. Implementation of Quick Sort
8. Implement Prim's Algorithm
9. Develop any stack Application
10. Implementation of Tree Traversal Algorithms

MAJOR EQUIPMENTS / SOFTWARE REQUIRED

Hardware

- 30 PCs
- Processor-2.0 GHz or Higher
- RAM-256 MB or Higher
- Hard disk-20 GB or Higher

Software

- TURBO C version 3 (or) GCC version 3.3.4
- OS-Windows2000/Windows XP/NT

L : 0 T: 0 P: 30 Total:30 PERIODS

COURSE OUTCOMES

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

CO1	Design algorithms and employ appropriate advanced data structures for solving problems efficiently
CO2	Understand various data structure such as stacks, queues, trees, graphs, etc
CO3	Implement various hashing techniques to avoid collision
CO4	Implement various kinds of searching and sorting techniques, and know when to choose which technique
CO5	Construct a suitable data structure and algorithm to solve a real world problem.

16EE209	ANALOG AND DIGITAL ELECTRONICS LABORATORY	L	T	P	C
		0	0	4	2

LIST OF EXPERIMENTS

1. Characteristics of a NPN Transistor under common emitter configuration
2. Characteristics of JFET and UJT
3. Design and testing of RC phase shift oscillators
4. Design and Frequency response characteristics of a Common Emitter amplifier
5. Differential amplifier
6. Study of astable and mono-stable multivibrators
7. Excess-3 to BCD and Binary to Gray code converter and vice-versa.
8. Encoders and Decoder
9. Design and implementation of 4-bit modulo synchronous counters using FFs
10. Universal Shift registers using Flip Flops.

MAJOR EQUIPMENTS / SOFTWARE REQUIRED

Hardware

- C.R.O
- D.C Power Supply(regulated)
- Function Generator
- IC Trainer Kit
- Digital multimeters

L : 0 T: 0 P: 60 Total:60 PERIODS

COURSE OUTCOMES

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

CO1 Practice the design procedure of various electronic circuit configurations

CO2 Understand about the operation and practical difficulties of electronic devices

CO3 Understand the operation of instrumentation amplifier

CO4 Design and implement counter logic circuits

CO5 Design the techniques adopted for shift registers

16EI220	ELECTRICAL MACHINES LABORATORY	L	T	P	C
		0	0	2	1

LIST OF EXPERIMENTS

1. Open circuit and Load characteristics of D.C. shunt generator
2. Load test on D.C. shunt motor
3. Load test on D.C. series motor
4. Load test on DC compound motor
5. Speed control of D.C. shunt motor
6. Load test on single phase transformer
7. Open circuit and short circuit tests on single phase transformer (Determination of equivalent circuit parameters)
8. Load test on single phase induction motor
9. No load and blocked rotor tests on three phase induction motor (Determination of equivalent circuit parameters)
10. Load test on three phase induction motor
11. Study of Starters

MAJOR EQUIPMENTS / SOFTWARE REQUIRED

- DC Motor – Generator Set
- DC Motor – Shunt Generator
- DC Shunt Motor
- DC Series Motor
- DC Compound Motor
- Single Phase Transformers
- Three Phase Induction Motor (Squirrel Cage)
- Single Phase Induction Motor
- Resistive Load Single Phase
- Single Phase Auto Transformer
- Three Phase Auto Transformer
- Moving Coil Ammeter of different Ranges
- Moving Coil Voltmeter of different Ranges
- Moving Iron Ammeter of different Ranges
- Moving Iron Voltmeter of different Ranges
- Wire Wound Rheostats of different ratings
- Tachometers
- Single Element Wattmeter of different ranges UPF/LPF
- Double Element Wattmeters of different ranges

L : 0 T: 0 P: 30 Total:30 PERIODS

COURSE OUTCOMES

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

CO1 Understand the performance and characteristics of DC machine, AC machine and Transformers

CO2 Understand the testing of DC machines and Transformers

CO3 Acquire knowledge about speed control techniques of DC machines

CO4 Conduct open circuit/ short circuit test on transformer

CO5 Conduct No Load and Full load tests on transformers/Induction Motor

16MA202	STATISTICS AND NUMERICAL METHODS	L	T	P	C
	(Common to AERO, AUTO, CIVIL, C&P, EEE, E&I, IT, MECH, MCT, MAE, BME)	3	1	0	4

UNIT I TESTING OF HYPOTHESIS 9+3

Sampling distributions – Tests for single mean, proportion, Difference of means (large and small samples) – Tests for single variance and equality of variances – Chi square test for goodness of fit-Independence of attributes.

UNIT II DESIGNS OF EXPERIMENTS 9+3

Completely Randomized Design – Randomized block design – Latin square Design – 2^2 factorial design.

UNIT III SOLUTIONS OF EQUATIONS AND EIGEN VALUE PROBLEMS 9+3

Newton Raphson method – Gauss Elimination method – Pivoting Gauss Jordan methods – Iterative methods of Gauss - Jacobi and Gauss - Seidal – Matrix Inversion by Gauss - Jordan method – Eigen values of a matrix by power method.

UNIT IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION 9+3

Lagrange's and Newton's divided difference interpolation – Newton's forward and backward difference interpolation – Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal and Simpson's $1/3^{rd}$ rules.

UNIT V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS 9+3

Taylor's series method – Euler's method – Modified Euler's Method – Fourth order Runge-Kutta method for solving first and second order equations – Milne's Predictor – corrector methods for solving first order equations.

L:45 T:15 P: 0 Total: 60 PERIODS

TEXT BOOKS

1 Johnson, R.A., and Gupta,C.B., Miller and Freund's, "Probability and statistics for Engineers", Pearson Education Asia,8th Edition, 2011.

2. Grewal, B.S and Grewal, J.S, "Numerical methods in Engineering and Science", 9th Edition, Khanna Publishers, New Delhi, 2012 .

REFERENCES

1 Spiegel,M.R., Schiller, J. and Srinivasan,R.A., "Schaum's Outlines Probabilty and Statistics", Tata McGraw Hill edition, 3rd Edition, 2011.

2 Chapra, S.C and Canale, R.P., "Numerical Methods for Engineers", 6th Edition, Tata McGraw Hill Edition, 2014 .

3 Gerald, C.F. and Wheatley, P.O. "Applied Numerical Analysis", 8th Edition, Pearson Education, Asia, New Delhi, 2014.

4 Walpole. R.E., Myers. R.H., Myers. S.L., and Ye. K., "Probability and Statistics for Engineers and Scientists", 8th Edition, Pearson Education, Asia, 2007.

5 Kandasamy, P., Thilagavathy. K and Gunavathy, K., "Numerical Methods", 3rd Edition, S.Chand & Company Pvt. Ltd, 2013.

COURSE OUTCOMES

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

CO1 Apply the statistical concepts and tools for engineering applications and to use different types of research methodology techniques for decision making under uncertainty.

CO2 Perform the ANOVA calculation which is needed for engineering research and project management.

CO3 Solve a set of algebraic equations representing steady state models formed in engineering problems

CO4 Find the trend information from discrete data set through numerical differentiation and summary information through numerical integration.

CO5 Predict the system dynamic behaviour through solution of ODEs modeling the system.

16EI211 INTRODUCTION TO CONTROL SYSTEMS L T P C

3 0 1 4

UNIT I SYSTEMS AND THEIR REPRESENTATION 9+3

Basic elements in control systems – Open and closed loop systems – Mathematical modeling of electrical and mechanical systems–Transfer function – Block diagram reduction techniques – Signal flow graphs.

MATLAB Implementation: Design of electrical and mechanical systems, MATLAB program to create transfer function.

UNIT II TIME RESPONSE 9+3

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 feedback control.

MATLAB Implementation: Response of P, PI and PID controller for standard error input.

UNIT III FREQUENCY RESPONSE 9+3

Frequency response – Bode plot – Polar plot – Determination of closed loop response from open loop response

MATLAB Implementation: Analysis of frequency response.

UNIT IV STABILITY ANALYSIS 9+3

Location of roots in S plane for stability – Routh Hurwitz criterion – Root locus construction - Nyquist stability criterion

MATLAB Implementation: Analyzing stability condition using root locus

UNIT V COMPENSATOR DESIGN 9+3

Basic Compensators – Lag, lead and lag-lead networks – Lag / Lead compensator design using bode plots.

MATLAB Implementation: Design of compensators.

L : 45 T: 0 P: 15 Total: 60 PERIODS

TEXT BOOKS

1. I.J. Nagrath and M. Gopal, Control Systems Engineering", New Age International Publishers, 2013
2. Benjamin C. Kuo, Automatic Control systems, Pearson Education, New Delhi, 2010
3. S N Deepa ,S N Sivanandam, Control systems Engineering using MATLAB -2E, Vikas Publishers

REFERENCES

1. K. Ogata, „Modern Control Engineering", 4th edition, PHI, New Delhi, 2012.
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, 2012
5. Rao. V. Dukkipati, Analysis and design of control systems using MATLAB, New Age International Publishers, 2006

COURSE OUTCOMES

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

CO1 Understand the methods of representation of systems and their desired transfer function models.

CO2 Identify and explain the type number and the order of the system and solve the steady state errors in the system

CO3 Construct bode plot, polar plot and root locus for the given system

CO4 Design a compensator and analyze the stability of a system using time domain and frequency domain specifications

CO5 Understand the concepts of state variable model and to identify their controllability and observability

16EI212 INDUSTRIAL INSTRUMENTATION – I

L	T	P	C
3	0	0	3

UNIT I MEASUREMENT OF FORCE, TORQUE AND SPEED 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 - Revolution counter – Capacitive tacho - Drag cup type tacho – DC and AC tacho generators

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 – Vibration sensors: 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 gauge-Ionization gauges:– Cold cathode type and hot cathode type- 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 thermometers - Sources of errors in - filled in systems and their compensation - Bimetallic thermometers - RTD - characteristics and signal conditioning-3 lead and 4 lead RTDs - Thermistors.

UNIT V THERMOCOUPLES AND RADIATION PYROMETERS 9

Thermocouples:- Laws of thermocouple –Fabrication of industrial thermocouples – Signal conditioning for thermocouple – 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 and Selective radiation pyrometers – Optical pyrometers-Two color radiation pyrometers

L : 45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 Krishnaswamy,K. and Vijaychitra,S. , " Industrial Instrumentation" , New age International publications, New Delhi, 2004

2 Doebelin,E.O.," Measurement Systems Application and Design", Tata McGraw – Hill Publishing company, 5th edition, 2004

REFERENCES

1 Jain, R.K.,"Mechanical and Industrial Measurements", Khanna Publishers, New Delhi 1999

2 Nakra,B.C., and Chaudry,K.K.,"Instrumentation measurement and Analysis", TataMcGraw-Hill publishing Company Limited, 3rd Edition, 2009

3 Singh.S.K, "Industrial Instrumentation and Control", 3rd Edition, Tata McGraw - Hill Education, 2008

4 Sawhney. A.K., "A course in Electrical & Electronic Measurements and Instrumentation", Dhanpath Rai & Co (P) Ltd, 2012

5 Patranabis,D.,"Principles of Industrial Instrumentation", 3rd Edition, Tata McGraw, 2010

COURSE OUTCOMES

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

CO1 Attain basic knowledge of load cells, torque meter and various velocity pickups.

CO2 Understand various accelerometer pickups, vibrometer and density meters.

CO3 Understand the basic principle and operation of various pressure measuring devices

CO4 Select a suitable instrument for measurement of temperature in industries

CO5 Acquire a sound knowledge about thermocouple and pyrometry technique

16EI213	TRANSDUCER ENGINEERING	L	T	P	C
		3	0	0	3

UNIT I SCIENCE OF MEASUREMENTS AND CLASSIFICATION OF TRANSDUCERS 9

Measurement - Basic methods of Measurements-Units and standards – Calibration methods Static calibration – Classification of errors – Error analysis – Limiting error - Probable error – Statistical methods – Odds and uncertainty – Classification of transducers -Selection of Transducers.

UNIT II CHARACTERISTICS OF TRANSDUCERS 9

Static characteristics: – Accuracy, precision, resolution, sensitivity, linearity, span and range – 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 applications of potentiometer - strain gauge - load cell - resistance thermometer – Thermistor - Thermo well - hot-wire anemometer - piezo resistive 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 applications of LVDT - Capacitive transducer and types – Capacitor microphone – Frequency response.

UNIT V OTHER TRANSDUCERS 9

Piezoelectric transducer - magnetostrictive transducer - IC sensor - Digital transducers- Smart sensor - Fibre optic transducer - Hall Effect transducer - Photo electric transducer.

L : 45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1. Doebelin.E.A, “Measurement Systems – Applications and Design”, Tata McGraw Hill, New York, 5th Edition, 2003.
2. Sawhney.A.K, “A course in Electrical & Electronic Measurement and Instrumentation”, Dhanpat Rai and Co (P) Ltd., 2012.

REFERENCES

1. John P. Bentley, “Principles of Measurement Systems”, 4th Edition, Pearson Education, 2004
2. Murthy, D.V.S., “Transducers and Instrumentation”, 2nd Edition, Prentice Hall of India Pvt. Ltd., New Delhi, 2010
3. Ramon Pallas-Areny, John G. Webster, “Sensors and Signal Conditioning”, Wiley-Inter science 2nd Edition, 1991
4. Patranabis.D, “Sensors and Transducers”, Prentice Hall of India, 2nd Edition, 2003
5. Bela G.Liptak, Instrument Engineers' Handbook, Process Measurement and Analysis, 4th Edition, Vol. 1, ISA/CRC Press, 2003

COURSE OUTCOMES

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

CO1 Define units and standards, their conversions, characteristics and error analysis of measurement systems.
CO2 Develop the mathematical model of the transducer
CO3 Classify and describe resistive transducer
CO4 Classify and describe inductive and capacitive transducers
CO5 Identify the various transducer used for various applications.

16EI214	INDUSTRIAL ELECTRONICS	L	T	P	C
		3	0	0	3

UNIT I POWER SEMI-CONDUCTOR DEVICES 9

Structure, Operation, Two -transistor model,V-I & Switching Characteristics of SCR – TRIAC – GTO – Power Transistors – BJT, MOSFET and IGBT with Static & Dynamic Characteristics, Drive circuit and Snubber Circuits for MOSFET.

UNIT II CONVERTERS 9

Controlled Converters –Single phase and three phaseconverters (bridge configuration)– Half wave, Midpoint and full wave converters using R, RL, RLE load, Performance parameters-Dual Converters – AC Voltage Controllers – Phase control. Integral cycle control, single phase AC voltage controller using R & RL load. Cycloconverters- 1Φ to 1Φ (Step up and Step down),3Φto 1Φ, 3Φ to 3Φcycloconveters.

UNIT III INVERTERS AND CHOPPERS (Qualitative treatment only) 9

Voltage Source Inverters– Single phase half and full bridge inverters, three phase invertersunder 120-degree and 180-degree mode - Voltage control using PWM – Current Source Inverter – Capacitor commutated CSI, ASCI, basic series inverter and parallel inverter –DC Choppers– Control strategies, step up and step down choppers-Class A, B, C, D and E Choppers.

UNIT IV DC AND AC DRIVES (Qualitative treatment only) 9

Introduction to DC Drives – Single and three phase thyristor converters fed DC drives- Semi converter and full converter operation – AC Drives – Speed Control of three phase Induction Motor – Stator Voltage and Stator Frequency Control of three Phase Induction Motor Drives

UNIT V APPLICATIONS 9

Switched Mode Power Supply (SMPS) – Fly back converter, Push pull converter Uninterrupted Power Supply (UPS) – Short break and No-break UPS – DC and AC Solid State Relays –- High Frequency Heating - Principle of Induction and Dielectric Heating.

L : 45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 Bimbra P. S, "Power Electronics", 5th Edition, Khanna publishers, Delhi, 2014.

2 Mithal G. K, "Industrial Electronics", Khanna Publishers, Delhi (2000).

REFERENCES

1 Rashid M. H, "Power Electronics: Circuits, Devices and Applications", 3rd Edition, Pearson Education, New Delhi, 2004..

2 Ned Mohan, Tore. M. Undeland, William.P.Robbins, "Power Electronics: Converters Applications and Design", 3rd Edition, Wiley India, 2009

3 Sen P. C, „Modern Power Electronics", 2nd Edition, Wheeler publishing Co. New Delhi (2005).

4 Bimal K. Bose, "Modern Power Electronics and AC Drives", 2nd Edition, Pearson Education, 2003.

5 Vedam Subrahmanyam, "Electric Drives, Concepts and Applications", 27th Edition, Tata Mc-Graw Hill Publishing Company limited, New Delhi, 2010

COURSE OUTCOMES

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

CO1 Learn the principles of operation of power electronic devices.

CO2 Understand the concepts of various converters

CO3 Understand the concepts of controlled rectifiers, choppers, single-phase and three phase thyristor inverters and cyclo converters.

CO4 Acquire knowledge on DC and AC Drives

CO5 Understand the applications of power semiconductors

16ME214 THERMOFLUIDICS FOR INSTRUMENTATION L T P C

3 1 0 4

UNIT I INTRODUCTION OF FLUID MECHANICS 8+3

Fluid – definition- real and ideal fluids, distinction between solid and fluid, units and dimensions - Properties of fluids – density, specific weight, specific volume, specific gravity, Viscosity, capillary and surface tension, compressibility and Vapour pressure- path line- Temperature influence on fluid properties - fluid statics- Application of control volume to continuity equation and its applications.(1D & 3D equations)

UNIT II FLUID DYNAMICS AND INCOMPRESSIBLE FLUID FLOW 9+3

Fluid dynamics – equation of motion- Euler's equation along stream line- Bernoulli's equation – applications - Venturi meter, Orifice meter and Pitot tube. Introduction- Laminar flow and turbulent flow (preliminary treatment only). Flow through pipes - Darcy -Weisbac's equation - minor losses - flow through pipes in series and in parallel.

UNIT III PUMPS AND TURBINES 9+3

Theory of roto-dynamic machines-various efficiencies-velocity components at entry and exit of the rotor-velocity triangle- Centrifugal pumps-working principle-work done by the impeller- Performance curves-various efficiencies-Reciprocating pumps-working principle-rotary pumps-classification. Introduction to turbines.

UNIT IV BASIC CONCEPTS AND LAWS OF THERMODYNAMICS 10+3

Classical approach-Thermodynamic systems- Control volume-system and surroundings- Properties- State-path-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)

UNIT V SECOND LAW OF THERMODYNAMICS 9+3

Second law of thermodynamics – Kelvin's and Clausius statements of second law. Reversibility and irreversibility. Carnot theorem, Carnot cycle, reversed Carnot cycle, efficiency, COP. Thermodynamic temperature scale, Clausius inequality.

L : 45 T: 15 P: 0 Total: 60 PERIODS

TEXT BOOKS

1 Bansal, R.K., "Fluid Mechanics and Hydraulics Machines", Laxmi Publications (P) Ltd., New Delhi. 2011. 9thEdition

2 Nag.P.K., "Engineering Thermodynamics", 5thEdition, Tata McGraw-Hill, New Delhi, 2013.

REFERENCES

1 Modi P.N. and Seth, S.M. "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House, New Delhi 2013. 19th Edition

2 Streeter. V. L., and Wylie, E.B., Fluid Mechanics, McGraw Hill, 2010. 9th Edition

3 Robert W.Fox, Alan T. McDonald, Philip J.Pritchard, "Fluid Mechanics and Machinery", 2011.

4 Natarajan E., "Engineering Thermodynamics: Fundamentals and Applications", Anuragam Publications, 2012.

5 Cengel. Y and M.Boles, "Thermodynamics - An Engineering Approach", 8th Edition, Tata McGraw Hill, 2014

COURSE OUTCOMES

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

CO1 apply the properties of fluids with mathematical knowledge

CO2 examine the change of fluid properties during flow through circular conduits

CO3 estimate the performance of the rotary machines and reciprocating pumps

CO4 analyze the work and heat interactions associated with a prescribed process path, and to perform a first law analysis of a flow system

CO5 demonstrate Carnot , Clausius equality , Inequality theorems and apply the principles of entropy in real time applications.

16GE212	CAREER DEVELOPMENT PROGRAMME IV	L	T	P	C
	(Common to all B.E. / B. Tech. Courses)	1	0	2	2*

UNIT I COMMUNICATION & SOFT SKILLS 7

Group Discussion – Types, guidelines, roles, Do's and Don'ts during GD, Mock GD. Interview Etiquettes – Meaning, Purpose, Interview Process and Types, Checklist – Do's and Don'ts, Preparation of Self Introduction.

UNIT II LINGUISTIC SKILLS IV 15

Cloze test, Direct & Indirect speech, Question Tags, Homonyms, HIGH LEVEL- Synonyms, Antonyms, Idioms and Phrases.

UNIT III VERBAL REASONING - III 7

Logical reasoning - Machine Input & Output, Coded Inequalities, Puzzles, Cubes, Data sufficiency, Analogy.

UNIT IV VERBAL &NON VERBAL REASONING - IV 8

Critical reasoning- Statement – Argument & Assumption, Courses of Action, Inferences.

Non Verbal reasoning- Insert the missing character, Figure series, Odd man out, Cubes & Dices, Logical Venn diagram.

UNIT V PRACTICALS 8

Group Discussion, Online typing, Mock Interview, Company website references.

L:15 T:0 P:30 Total: 45 PERIODS

TEXT BOOKS

1 Barun K. Mithra, "Personality Development & Soft Skills", Oxford, 2006.
2 S.P.Bakshi, "Objective English" Arihant Publications, 2014.

REFERENCES

1 Dr. R.S.Agarwal, "A modern approach to Verbal & Non-verbal Reasoning", S.Chand & Company Pvt Limited, 2013.
2 S.P.Bakshi, "Objective English" Arihant Publications, 2014.
3 Dr. Aggarwal R.S and Monika Agarwal, "Objective General English", New Delhi, Sultan Chand and Company Ltd., 1999.
4 Arun Sharma & Meenakshi Upadhay,"Verbal ability and Reading comprehension".Mc Graw Hill Education.
5 Dutt Kiranmai.P, Rajeevan Geethe & Prakash C.L.N 'A course in Communication Skills ,First publications Cambridge University Press India Pvt.Ltd , 2008.

COURSE OUTCOMES

At the end of the course students should be able to

CO1 Bring behavioral changes through interview etiquettes & communicate well.
CO2 Improve their thinking ability.
CO3 Solve the puzzles through their lateral thinking ability.
CO4 Think critically and attain solutions for the problems.
CO5 Speak better in GD and thorough with the company details.

16GE214	CAREER DEVELOPMENT PROGRAMME IV	L	T	P	C
	(Common to all B.E. / B. Tech. Courses)	1	0	2	2*

UNIT I BODY LANGUAGE 9

Body Language – Introduction, Elements, Grooming, Body Language –Postures and Gestures, Dressing Etiquette, Hygiene and Cleanliness, Time Management, Body Language - Positive and Negative ,Importance of body language in Communication.

UNIT II INTERVIEW ETIQUETTE 9

Interview Etiquettes – Meaning, Purpose, Process, Types, Do's and Dont's, Dress Code, Self Introduction, Code of Conduct for Interviews, Mock Interview

UNIT III RESUME BUILDING 9

Resume Building –Introduction, difference between Resume and CV, Strategy of resume writing, Body of the resume, clarity and crispness, format and content, Resume Etiquettes – Do's and Dont's, model resume writing.

UNIT IV GROUP DISCUSSION 9

Group Discussion – Types, Key steps to succeed in GD, Skills required for GD, Importance of GD, Guidelines – Do's and Dont's during GD, the technique of Summing up, Mock GD.

UNIT V PRACTICALS 9

Extempore Speech, Company website References, Short speech.

L:15 T:0 P:30 Total: 45 PERIODS

TEXT BOOKS

1 John Eastwood, "Oxford Practice Grammar", Oxford.

2 Barun K. Mithra, "Personality Development & Soft Skills", Oxford.

REFERENCES

1 Sanjay Kumar "Communication Skills", Oxford University 2015.

2 R.V.Praveen, "Quantitative Aptitude and Reasoning" PHI Publication, 2012.

3 Dr. Aggarwal R.S and Monika Agarwal, "Objective General English", New Delhi, Sultan Chand and Company Ltd., 1999.

4 Arun Sharma & Meenakshi Upadhay,"Verbal ability and Reading comprehension".Mc Graw Hill Education.

5 Dutt Kiranmai.P, Rajeevan Geethe & Prakash C.L.N 'A course in Communication Skills ,First publications Cambridge University Press India Pvt.Ltd , 2008.

COURSE OUTCOMES

At the end of the course students should be able to

CO1 Exhibit appropriate body language and interview skills.

CO2 Speak effectively in group discussion and acquire interpersonal skills.

CO3 Acquire the professional skills of Group discussion and Resume writing.

CO4 Improve thinking, listening and speaking skills.

CO5 Demonstrate an understanding of the principles of active listening.

16EI230	TRANSDUCERS AND MEASUREMENTS LABORATORY	L	T	P	C
		0	0	2	1

LIST OF EXPERIMENTS

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.
4. Characteristic of LDR, thermistor and thermocouple.
5. Step response characteristic of RTD and thermocouple.
6. Wheatstone and Kelvin double bridge for resistance measurement.
7. Schering Bridge for capacitance measurement and Anderson Bridge for inductance measurement.
8. Calibration of Single phase Energy meter.
9. Calibration of Single phase Wattmeter.
10. Calibration of Ammeter and Voltmeter

MAJOR EQUIPMENTS / SOFTWARE REQUIRED

- Potentiometer – Linear Displacement
- Transducer Kit
- Strain Gauge and Load Cell kit
- Loads for measurement
- LVDT trainer kit
- Hall Effect characteristics trainer
- Photoconductive trainer kit
- Thermistor trainer kit
- Heater
- Thermistor
- Thermometer
- RTD
- Wheatstone bridge kit
- Decade Resistance Box
- Multimeter
- Kelvin‟s Double bridge kit
- Schering Bridge kit
- Decade Capacitance Box
- Andersons bridge kit
- Decade Inductance Box
- Energy meter calibration kit
- Watt meter calibration kit
- Single phase ammeter kit
- Single phase voltmeter calibration kit
- Single phase resistive load

L : 0 T: 0 P: 30 Total:30 PERIODS

COURSE OUTCOMES

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

CO1 Study the characteristics of Strain Gauge, potentiometer

CO2 Understand the characteristics of LVDT, LDR and temperature transducers

CO3 Analyse the working of DC bridges

CO4 Measure Inductance and capacitance using AC bridges

CO5 Calibrate various meters

16ME215 **THERMOFLUIDICS LABORATORY** **L T P C**

0 0 4 2

LIST OF EXPERIMENTS

1. Valve timing and port timing diagrams for IC Engines
2. Port timing diagrams for IC Engines.
3. Performance test on a petrol Engine
4. Performance test on a diesel Engine
5. Demonstration on the steam boiler
6. Determination of the coefficient of discharge of given orifice meter / Venturimeter
7. Performance studies on centrifugal pump
8. Performance studies on reciprocating pump
9. Performance studies on reaction turbine
10. Performance studies on impulse turbine

MAJOR EQUIPMENTS / SOFTWARE REQUIRED

- Orifice meter
- Venturimeter
- Centrifugal pump
- Reciprocating pump
- Francis Turbine
- Pelton wheel
- Engine cut section models
- Single cylinder petrol engine with mechanical dynamometer
- Single cylinder diesel engine with electrical dynamometer Steam Boiler

L : 0 T: 0 P: 60 Total:60 PERIODS

COURSE OUTCOMES

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

CO1 familiarize with flow measuring instruments like venture and orifice meter

CO2 know the operation of pumps and turbines

CO3 able to draw performance graphs for pump and turbine

CO4 analyze the thermal characteristics of IC engines

CO5 evaluate efficiency Test on I.C. engines and its timing diagrams

16GE301	PROFESSIONAL ETHICS	L	T	P	C
	(Common to all B.E. / B. Tech. Courses)	3	0	0	3

UNIT I ENGINEERING ETHICS 9

Senses of Engineering ethics – Variety of moral issues – Types of inquiry- Moral dilemmas. Moral autonomy – Kolberg's theory – Gilligan's theory – consensus and controversy – professions and professionalism – professional ideals and virtues – theories about right action – self-interest – customs and religion – use of ethical theories.

UNIT II ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as social experimentation – engineers as responsible experimenters – codes of ethics – a balanced outlook on law – Case studies.

UNIT III ENGINEERS RESPONSIBILITY FOR SAFETY 9

Safety and risk – assessment of safety and risk – risk benefit analysis – reducing risk – Case studies.

UNIT IV RESPONSIBILITIES AND RIGHTS 9

Collegiality and loyalty – respect for authority – collective bargaining – confidentiality – conflicts of interest –occupational crime – professional rights –employee right – discrimination – intellectual property rights, Case studies.

UNIT V GLOBAL ISSUE 9

Multinational corporations – environmental ethics – computer ethics – weapons development – engineers as managers – consulting engineers – engineers as expert witnesses and advisors – moral leadership – sample code of conduct, Case studies.

L:45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 Mike Martin and Roland Schinzinger, "Ethics in Engineering" McGraw hill, NewYork, 2004.
2. Govindarajan. M, Natarajan. S,Senthilkumar. V.S, "Engineering Ethics" Prentice Hall, New Delhi, 2004.

REFERENCES

1 Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics– Concepts and Cases", Cengage Learning, 2009 .
2 Laura P. Hartman and Joe Desjardins, "Business Ethics: Decision Making for Personal Integrity and Social Responsibility" McGraw Hill education, India Pvt.Ltd., New Delhi 2013 .
3 Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
4 Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective", Biztantra, New Delhi, (2004).
5 David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, 2003.

COURSE OUTCOMES

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

CO1 Understand the basic perception of profession, professional ethics, various moral issues and uses of ethical theories.

CO2 Identify various social issues, industrial standards, code of ethics and role of professional ethics in engineering field.

CO3 Realize the responsibilities of an engineer for safety and risk benefit analysis.

CO4 Recognize the professional rights and responsibilities of an engineer.

CO5 Acquire knowledge about various roles of engineers in variety of global issues and able to apply ethical principles to resolve situations that arise in their professional career.

16CS451 OBJECT ORIENTED PROGRAMMING USING C++ L T P C

(Common to ECE,MCT, EEE & EIE) **3 0 0 3**

UNIT I INTRODUCTION 9

Need for object oriented programming – Procedural Languages vs. Object oriented approach – Characteristics Object oriented programming – C++ Programming Basics: Basic Program Construction – Output Using cout – Input with cin – Data types – Variables and Constants – Operators – Control Statements-Manipulators-Type conversion.

UNIT II OBJECTS AND CLASSES 9

Simple Class – C++ Objects as Physical Objects – C++ Object as Data types – Constructors and Destructors – Object as Function Arguments – Returning Objects from Functions – Structures and Classes – Arrays and Strings.

UNIT III OPERATOR OVERLOADING AND INHERITANCE 9

Need of operator overloading – Overloading Unary Operators – Overloading binary Operators – Overloading Special Operators – Data Conversion – Inheritance: Derived Class and Base Class – Derived Class Constructors – Overriding Member Functions-Class Hierarchies – Public and Private Inheritance – Levels of Inheritance – Multiple Inheritance.

UNIT IV POLYMORPHISM AND FILE STREAMS 9

Virtual Function – Friend Function – Static Function-Assignment and Copy Initialization – Streams – String I/O – Character I/O – Object I/O – I/O with Multiple Objects – File Pointers – Disk I/O with Member Functions – Error Handling in File I/O.

UNIT V TEMPLATES AND EXCEPTION HANDLING 9

Templates: Introduction – Function Templates – Overloading Function Templates – Class Templates – Exception Handling – Syntax, multiple exceptions, exceptions with arguments.

L : 45 T: 0 P: 0 J: 0 Total: 45 PERIODS

TEXT BOOKS

1 Robert Lafore, Object Oriented Programming in-C++, Galgotia Publication, 2009.
2. Deitel & Deitel, "C++ How to program", Prentice Hall,2005.

REFERENCES

1 D.S.Malik, "C++ Programming", Thomson, 2007.
2 K.R. Venugopal, Rajkumar and T.Ravishankar, "Mastering C++", Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2006.
3 Balagurusamy, "Object Oriented Programming with C++", Sixth Edition,McGraw Hill Education ,2013.
4 Joyce Farrell ,"Object-Oriented Programming Using C++", Fourth Edition,2008.
5 Subhash K U, "Object Oriented Programming With C++", First Edition, Pearson Education,2010.

COURSE OUTCOMES

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

CO1 Determine the needs of object oriented programming.
CO2 Differentiate the functionalities of object oriented approach and procedural languages.
CO3 Demonstrate the concept of operator overloading and inheritance.
CO4 Demonstrate the concepts of polymorphism and file streams.
CO5 Develop create templates and handle exceptions.

16EI301 PIC MICROCONTROLLERS AND ARM PROCESSOR L T P C
3 0 1 4

UNIT I PIC MICROCONTROLLER 9+3

Architecture – memory organization – addressing modes – instruction set – PIC programming in Assembly & C –I/O port, Data Conversion, RAM & ROM Allocation. Implementation using MPLAB: Arithmetic and logical operations, Addressing modes

UNIT II PERIPHERAL INTERFCAING OF PIC MICROCONTROLLER 9+3

Timers – Interrupts, I/O ports- I2C bus- ADC, DAC and Sensor Interfacing - Interfacing LCD Display – Keypad Interfacing -UART- CCP modules -Flash and EEPROM memories Implementation using MPLAB: I/O Configuration and DAQ (Sensor Interfacing) , Interfacing ADC for LCD display, Interfacing DAC to RELAY , Interfacing KEYPAD

UNIT III ARM ARCHITECTURE 9+3

ARM Architecture- ARM programmer‟s model - Addressing modes- instruction set-Data processing instructions, Data transfer instructions, ARM Condition codes, Branches, Software interrupt (SWI), Multiply instructions-ARM Assembly Language programming .

UNIT IV PERIPHERAL INTERFCAING OF ARM PROCESSOR 9+3

Timer – UART –interrupt structure – ADC AND DAC Interfacing keyboard Interface, LCD interface, on chip ADC/DAC interface. Implementation using Keil: Interfacing ADC for LCD display, Interfacing DAC to RELAY , Interfacing KEYPAD

UNIT V APPLICATIONS 9+3

ARM Processor based Real-time Car Theft Decline System -ARM Processor based Drunken People Identification With Auto Ignition Disable Function-Design and Implementation of Automatic Turn off for Water Pump with Four Different Time Slots using ARM Processor-ARM Cortex (STM32) based Solar Street Light

L : 45 T: 0 P:15 Total: 60 PERIODS

TEXT BOOKS

1. Muhammad Ali Mazidi, Rolin D. Mckinlay,Danny Causey “PIC Microcontroller and Embedded systems using Assembly and C for PIC18” , Pearson Education 2008
2. Andrew Sloss, Dominic systems and chris wright, “ARM System Developers guide designing and optimizing system”, Elsevier India private limited, New Delhi, 2009

REFERENCES

1. Dr. Jonathan W. Valvano, “Embedded Systems: Introduction to ARM Cortex-M Microcontrollers”,2012
2. A.K.Ray & K.M Bhurchandi, „Advanced Microprocessor and Peripherals – Architecture, Programming and Interfacing‟, Tata Mc Graw Hill, 2006.
3. Yn-cheng Liu,Glenn A.Gibson, „Microcomputer systems: The 8086 / 8088 Family architecture, Programming and Design‟ , 2nd Edition, Prentice Hall of India , 2006
4. Michael J. Pont, „Embedded C‟, Addison Wesley, 2002.

COURSE OUTCOMES

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

CO1 Understand the architecture of PIC microcontroller and perform basic arithmetic & logical operations in MP LAB
CO2 Interface PIC microcontroller with I/O devices and implement them in MP LAB
CO3 Acquire Knowledge of ARM Processor and implement logic operations in Keil
CO4 Interface ARM Processor with the I/O devices and implement in Keil.
CO5 Develop programs for real time applications using ARM Processor

16EI302	INDUSTRIAL INSTRUMENTATION – II	L	T	P	C
		3	0	0	3

UNIT I VARIABLE HEAD TYPE FLOWMETERS 9

Theory of fixed restriction Variable Head Type Flow Meters – Orifice Plate: Types of orifice plates – Venturi Tube – Flow Nozzle – Dall Tube– Pitot Tube – Installation of Head Flow Meters.

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 Meter – Thermal – Coriolis Type Mass Flow Meters – Calibration of Flow Meters using dynamic weighing method.

UNIT III ELECTRICAL TYPE FLOW METERS 9

Principle and constructional details of electromagnetic flow meter – different types of excitation used – Ultrasonic flow meters – Laser Doppler anemometer – Vortex shedding flow meter – Target flow meter – Guidelines for selection of flow meter.

UNIT IV LEVEL MEASUREMENT 9

Level measurement: – Float, Displacer type – Bubbler system – Electrical level gauge: – Resistance – Capacitance –Nuclear radiation and Ultrasonic type –Boiler drum level measurement: – Differential pressure method.

UNIT V MEASUREMENT OF VISCOSITY, HUMIDITY AND MOISTURE 9

Viscosity – Rotameter type viscometer – Consistency meters – Dry and wet bulb psychrometers – Hot wire electrode type hygrometer – Dew cell – Electrolysis type hygrometer – Commercial type dew point meter – Moisture measurement: – Moisture measurement in granular materials.

L : 45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 Doebelin E.O, "Measurement Systems Application and Design", Tata McGraw Hill Publishing Company, 5th Edition, 2004

2 Krishnaswamy . K, „Industrial Instrumentation", New Age International Private Limited, 2nd Edition, 2010

REFERENCES

1 Jain,R.K., "Mechanical and Industrial Measurements", Khanna Publishers, New Delhi, 3rd Edition, 1999.

2 Nakra,B.C., and Chaudry,K.K.,"Instrumentation Measurement and Analysis", Tata McGraw Hill Publishing Company Limited, 3rd Edition, 2009

3 Singh.S.K, "Industrial Instrumentation and Control", 3rd Edition, Tata McGraw – Hill Education, 2008.

4 Patranabis,D.,"Principles of Industrial Instrumentation", 3rd Edition, Tata McGraw Hill publishing Company Ltd., New Delhi, 2010.

5 Liptak, B.G., "Instrumentation Engineers Handbook (Measurement)", CRC Press, 3rd Edition, 2005

COURSE OUTCOMES

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

CO1 Identify the head type flow meters for specific applications

CO2 Describe the installation of flow meters

CO3 Implement various electrical type flow meters

CO4 Apply sound knowledge on selection of suitable level instruments

CO5 Attain basic knowledge in viscosity, moisture and humidity measurement

16EI310	CAREER DEVELOPMENT PROGRAMME V	L	T	P	C
		2	0	0	2

UNIT I CIRCUITS AND ANALYSIS 6

Kirchhoff's laws, mesh and nodal Analysis; Circuit theorems; One-port and two-port Network Functions; Static and dynamic characteristics of Measurement Systems; Error and uncertainty analysis.

UNIT II TRANSDUCERS, MECHANICAL MEASUREMENT AND INDUSTRIAL INSTRUMENTATION 6

Resistive, Capacitive, Inductive and piezoelectric transducers and their signal conditioning; Measurement of displacement, velocity and acceleration (translational and rotational), force, torque, vibration and shock; Measurement of pressure, flow, temperature and liquid level; Measurement of pH, conductivity, viscosity and humidity.

UNIT III ANALOG AND DIGITAL ELECTRONICS 6

Characteristics of diode, BJT, JFET and MOSFET; Operational amplifiers and its applications; Instrumentation amplifier; V-to-I and I-to-V converter. Combinational logic circuits, minimization of Boolean functions; Sequential circuits, flip-flops, counters, shift registers; Multiplexer, S/H circuit; Analog-to-Digital and Digital-to-Analog converters; Microcontrollers and Microprocessors.

UNIT IV ELECTRICAL AND ELECTRONIC MEASUREMENTS 6

Bridges and potentiometers, measurement of R, L and C; Measurements of voltage, current, power, power factor and energy; A.C & D.C current probe; Extension of instrument ranges; Q meter and waveform analyze; Digital voltmeter and multi-meter; Time, phase and frequency measurements.

UNIT V ELECTRICAL MACHINES 6

Single phase and three phase transformer – equivalent circuit, tests, regulation and efficiency; DC machines and AC machines – types, windings, generator characteristics, armature reaction and commutation, starting and speed control of motors; three phase induction motors.

L : 30 T: 0 P: 0 Total: 30 PERIODS

TEXT BOOKS

1 Doebelin E.O, "Measurement Systems Application and Design", Tata McGraw Hill Publishing Company, 5th Edition, 2004.

2 Krishnaswamy.K, 'Industrial Instrumentation', New Age International Private Limited, 2nd Edition, 2010.

REFERENCES

1 Jain R.K., "Mechanical and Industrial Measurements", Khanna Publishers, New Delhi, 3rd Edition, 1999.

2 Nakra B.C., and Chaudry K.K.,"Instrumentation Measurement and Analysis", Tata McGraw Hill Publishing Company Limited, 3rd Edition, 2009.

3 Singh.S.K, "Industrial Instrumentation and Control", 3rd Edition, Tata McGraw – Hill Education, 2008.

4 Patranabis D.,"Principles of Industrial Instrumentation", 3rd Edition, Tata McGraw Hill publishing Company Ltd., New Delhi, 2010

5. Liptak B.G "Instrumentation Engineers Handbook(Measurement)",CRC Press, 3rd Edition, 2005.

COURSE OUTCOMES

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

CO1 Design and analysis of circuits

CO2 Understand the working of various transducer and instruments used in industries

CO3 Acquire knowledge on analog and digital electronic circuits

CO4 Acquire knowledge on various electrical measuring instruments

CO5 Gain knowledge on various motors and generators

16GE313	CAREER DEVELOPMENT PROGRAMME V	L	T	P	C
	(Common to all B.E. / B. Tech. Courses)	1	0	2	2*

UNIT I QUANTITATIVE ABILITY I **9**

Number theory- Shortcuts, Divisibility criteria- Unit place deduction-LCM &HCF, Square root and Cube Root, Decimal & Fraction, Percentage.

UNIT II QUANTITATIVE ABILITY II **9**

Profit, loss and discount, Simple and compound interest, Ratio & Proportions, Mixtures & Allegation, Partnership.

UNIT III QUANTITATIVE ABILITY III **9**

Problems on Ages, Average, Venn diagram, Clocks, Calendar, Data Interpretation- Bar chart- Pie chart- Line chart-Tables chart.

UNIT IV VERBAL REASONING I **9**

Analytical reasoning - Linear, Circular & Complex arrangement, Blood relation, Direction Problems, Puzzle.

UNIT V VERBAL REASONING II **9**

Logical reasoning - Number and Alpha series, Odd man out, Element series, Logical series, Coding and decoding, Analogy, Alphabets, Logical sequence of words.

L : 15 T:0 P:30 Total: 45 PERIODS

TEXT BOOKS

1 Rajesh Varma, "Fast Track Objective Arithmetic", Arihant Publications.
2 BS Sijwali- Indu Sijwali, A New Approach to "Reasoning Verbal, Non-Verbal & Analytical", Arihant Publications.

REFERENCES

1 R.V.Praveen, "Quantitative Aptitude and Reasoning" PHI Publication.
2 R.S.Agarwal, "Quantitative Aptitude for Competitive Examinations", S.Chand & Company Pvt Limited.
3 M.K.Panday, "Analytical Reasoning", Magical Series.
4 Wiley's Quantitative Aptitude Book - P.A. Anand.
5 The Pearson Guide To Quantitative Aptitude For Competitive – Arun Sharma.

COURSE OUTCOMES

At the end of the course students should be able to

CO1 Know the both analytical and logical reasoning
CO2 Apply the shortcut methods in quantitative aptitude.
CO3 Solve application orientated concepts in quantitative aptitude.
CO4 Improve the quality of the student as a finished product for their corporate life.
CO5 Understand and practice Logical reasoning.

16CS452	OBJECT ORIENTED PROGRAMMING USING C++LABORATORY	L	T	P	C
	(Common to ECE,MCT, EEE & EIE)	0	0	4	2

LIST OF EXPERIMENTS

1. Define a class to represent a bank account to include the following members.

Data Members: Name of the depositors, Account number, Type of account, Balance amount in the account.

Member functions:

To initialize values to data members

To deposit an amount

To withdraw an account after checking the balance

To display the name and the balance

Note: Try to use all types of constructors

2. Apply function overloading and operator overloading to the given problems.
3. Implement the concept of default argument function.
4. Implement the concept of array of objects.
5. Apprehend a class with dynamic objects and use constructors and destructors.
6. Execute the concept of Inheritance.
7. Illustrate the use of static data member and static member functions by keeping track of number of instances of object that are created and alive.
8. Implement friend functions and friend classes to add the private data member of two different classes.
9. Exercise the file handling concepts Copy the content of one file to another file by removing unnecessary spaces between words.
10. Realize the following concepts:

(i) Class templates and Function templates

(ii) Exception Handling

11. Design Experiments.
12. Application Oriented Experiments: Mini Project.

MAJOR EQUIPMENTS / SOFTWARE REQUIRED

Hardware

- PC – 30 nos.
- Processor – 2.0 GHz or higher
- RAM – 256 MB or higher
- Hard disk – 20 GB or higher
- OS- Windows 2000/ Windows XP/ NT

Software

Turbo C (freeware) – to be installed in all PC's.

L : 0 T: 0 P: 60 Total:60 PERIODS

COURSE OUTCOMES

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

CO1 Strengthen the problem solving ability by applying the characteristics of an object- oriented approach.

CO2 Implements fundamental constructs of OOP- classes, objects friend function, inline functions and dynamic programming.

CO3 Apply critical thinking skills and creativity to solve the problems.

CO4 To design and implement object oriented software to solve moderately complex problems.

CO5 Develop application using OOP concepts

16EI320	PIC MICROCONTROLLERS AND ARM PROCESSOR LABORATORY	L	T	P	C
		0	0	2	1

LIST OF EXPERIMENTS

1. LED Blinking using PIC controller (16F877A) with MPLAB
2. To display a message on LCD using PIC controller
3. Interfacing ADC to display analog to digital conversion values on LCD
4. Interfacing KEYPAD to display value on LCD when a key is pressed.
5. To display message in 7segment
6. Interfacing GSM modem to send and receive the message
7. Interfacing Bluetooth module
8. Interfacing Zigbee Module
9. Interfacing RELAY to turn the relays ON and OFF
10. Display a message using I2C Protocol
11. Traffic light controller – Two lane
12. Traffic light controller – Four lane

MAJOR EQUIPMENTS / SOFTWARE REQUIRED

- PIC MC Trainer Kit
- APRM 7 Processor Kit
- 12 V Power Supply
- Zigbee Module
- Ardiuno Kit
- 4x4 LCD Display
- Connection Pin
- RS 232 Cable
- Wi-Fi Module
- Keyboard

L : 0 T: 0 P: 30 Total:30 PERIODS

COURSE OUTCOMES

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

CO1 Understand the architecture of PIC microcontroller
CO2 Interface PIC microcontroller with I/O devices
CO3 Acquire Knowledge of ARM Processor
CO4 Interface ARM Processor with the I/O devices and implement in Keil.
CO5 Develop programs for real time applications using ARM Processor

16EI321	INDUSTRIAL INSTRUMENTATION LABORATORY	L	T	P	C
		0	0	2	1

LIST OF EXPERIMENTS

1. Discharge coefficient of orifice plate.
2. Discharge coefficient of Venturi Meter.
3. Calibration of pressure gauge.
4. Torque measurement.
5. Viscosity measurement.
6. Vacuum pressure measurement.
7. Level measurement using differential pressure transmitter.
8. UV – Visible spectrophotometer.
9. pH meter standardization and measurement of pH values of solutions.
10. Measurements of conductivity of test solutions.

MAJOR EQUIPMENTS / SOFTWARE REQUIRED

- Orifice plate
- Venturimeter
- Dead weight tester with pressure gauge
- Torque trainer
- Saybolt Viscometer
- Vacuum gauge
- DP transmitter
- UV – Visible spectrophotometer
- pH meter
- Conductivity meter
- Tacho meter

L : 0 T: 0 P: 30 Total:30 PERIODS

COURSE OUTCOMES

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

CO1	Ability to experimentally measure industrial process parameters such as flow, level, temperature, pressure and viscosity
CO2	Ability to measure and analyze pH, conductivity, UV absorbance and transmittance
CO3	Ability to identify, formulate, and analyze problems regarding sensors and transmitter
CO4	Ability to understand the operation of different types of analytical Instruments
CO5	Able to calibrate meters, sensors and transmitters.

16EI324	PLC & SCADA	L	T	P	C
		3	0	0	3

UNIT I INTRODUCTION TO PLC **9**

Automation – Definition, Components & Applications. PLC – History, Architecture, Comparison with relay logic, Inputs, Outputs, PLC scan cycle, Concept of sink and source, Normally Open and Normally closed Contacts. Ladder logic programming.

Software Implementation: Logic gates

UNIT II PLC PROGRAMMING **9**

Program Instructions, Basic programs using switches and coils, Concept of Latch, blinking and process repeat. Timers & Counters in PLC. Software Implementation: Two way Traffic Control, Four way Traffic Control, Coffee maker application, Packing application, Bottle filling application.

UNIT III ALLEN BRADLEY PLC **9**

Allen Bradley PLC – pin configuration and technical specifications, Programming Instructions. Input and Output Wiring, Installation, Selection, Trouble shooting and Maintenance. RSLogix 5000 implementation: Material Handling, Automatic control of warehouse door, Automatic lubrication of oil supplier, Conveyor belt motor control, Automatic car washing machine, Bottle label detection

UNIT IV SCADA **9**

SCADA: Introduction, Evolution, Features, Architecture, Communications, Configuration Wonderware Intouch SCADA Implementation: Creating & Editing graphic display with animation, Data Entry / Start Stop command, Analog entry, Sizing, Movement, Blinking, Visibility, Filling, Creating Alarms & Events, Writing logic through script.

UNIT V SCADA INTERFACING & APPLICATIONS **9**

Interfacing SCADA & PLC. PLC and SCADA Applications: Parking System, Priority Circuit (Quiz Competitions), Product Packaging, Water level monitoring system, Automatic door control, automatic coffee maker.

L :45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1. Gary G Anderson, „PLC Programming using RSLogix 500: Basic Concepts of Ladder Logic Programming‟: Volume 1 (Plc Programming Basics), Create Space Independent Publishing Platform
2. Stuart A Boyer, SCADA supervisory control and data acquisition

REFERENCES

1. K. L.S. Sharma, Overview of Industrial Process Automation, Elsevier, 2011 Batten G. L., Programmable Controllers‟, McGraw Hill Inc., Second Edition
2. Pradeep Kumar & Srivashtava ‚Programmable Logic Controller- BPB‟ Publications
3. Mdhuchhanda Mitra, SamarjitSen Gupta, Programmable Logic Controllers and Industrial Automation, An Introduction" Penram International Publishing Limited
4. Hughes .T, Programmable Logic Controllers‟, ISA Press, 1989
5. Gordan Clark, Deem Reynders, „Practical Modem SCADA Protocols", 2002.

COURSE OUTCOMES

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

CO1 Understand architecture of PLC and develop ladder logic programs for logic gates implementation
CO2 Gain knowledge of programming concepts of PLC and develop programs for real time applications
CO3 Implement real time control using Allen Bradley PLC
CO4 Design front end for various practical applications using wonder ware Intouch SCADA
CO5 Interface PLC & SCADA and implement them for monitoring and control applications

16EI322	VIRTUAL INSTRUMENTATION	L	T	P	C
		3	0	0	3

UNIT I INTRODUCTION **9**

Block Diagram of a Virtual Instrument – Physical Quantities and Analog Interfaces – Hardware and Software – User Interfaces – Advantages of Virtual Instruments over Conventional Instruments – Architecture of a Virtual Instrument and its Relation to the Operating System.

Basic programming using Labview: Arithmetic and Logical operations

UNIT II PROGRAMMING TECHNIQUES **9**

FOR Loops, WHILE Loops – CASE Structure – Sequence Structure – Formula Nodes - Arrays and Clusters – Array Operations – Bundle/Bundle by Name – UnBundle/Unbundle by Name – Graphs and Charts – String and File I/O – High Level and Low Level File I/O‟s – Attribute nodes - Local and Global Variables.

Implementation using Labview: Calculation of CGPA, Generation of waveforms (Sine and Square)

UNIT III INSTRUMENT INTERFACE STANDARDS **9**

EIA 232 Interface Standard – EIA 485 Interface Standard – EIA 422 Interface Standard – 20 mA Current Loop – Serial Interface Converters - Data Acquisition System – Serial Bus : CAN Bus – MOD Bus – ISO-OSI Models.

UNIT IV DATA ACQUISITION AND INSTRUMENT CONTROL **9**

DAQ – Components – Buffers: Buffered and Non-Buffered I/O –Analog I/O –Digital I/O – Counters and Timers - Instrument Control: VISA – GPIB –- PC Hardware Structure – Timing - Interrupts – DMA – GPIB/IEEE 488 Concepts. Implementation using Labview: Real time temperature measurement and control, Measurement of Level.

UNIT V APPLICATIONS **9**

Temperature Indicator – Tank Simulation – ON-OFF Controller – PID Controller – CRO – Function Generator – Real Time Data Acquisition – IMAQ – Motion Control: General Applications – Feedback Devices – Case Studies.

L : 45 T: 0 P:0 Total: 45 PERIODS

TEXT BOOKS

1. Sanjay Gupta and Joseph John., “Virtual Instrumentation using LabVIEW”, Tata McGraw Hill Publishing Company Ltd., 2nd Edition, New Delhi, 2010
2. Garry W Johnson, “LabVIEW Graphical Programming”, Tata McGraw Hill book Co, 4th Edition, , 2006

REFERENCES

1. Gupta S. and Gupta J.P., “PC Interfacing for Data Acquisition and Process Control”, Instrument Society of America, 2nd Edition, 1994.
2. Dr. Sumathi. S and Prof. Surekha. P, “LabVIEW Based Advanced Instrumentation Systems”, 2nd Edition, 2007.
3. Johnson Gary W. and Jennings Richard, “LabVIEW Graphical Programming”, McGraw- Hill Professional, 3rd Edition, New York, 2006.
4. Jovitha Jerome,”Virtual Instumentation using LABVIEW”, PHI Publishers, 2nd Edition, New Delhi, 2010.

COURSE OUTCOMES

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

- **CO1** Understand virtual instrumentation and develop Lab VIEW programs for arithmetic and logical operations
- **CO2** Gain knowledge of conditional statements and file handling and develop Lab VIEW programs for practical applications
- **CO3** Understand the various interface standards used in instrumentation
- **CO4** Acquire real time data using DAQ and control process parameters using Lab VIEW
- **CO5** Develop Lab View programs for real time applications

16EI323	PROCESS CONTROL	L	T	P	C
		3	0	0	3

UNIT I INTRODUCTION TO PROCESS CONTROL 9

Need for Process Control – Mathematical Model of Level – Pressure and Thermal Processes – Interacting and Non-interacting Systems – Degrees of Freedom – Continuous and Batch Processes – Self Regulation – Servo and Regulatory Operations.

UNIT II CONTROL ACTIONS 9

Characteristic of ON-OFF – Single Speed Floating – Proportional– Integral and Derivative Controllers –composite control modes: P+I – P+D and P+I+D Control Modes – electronic controllers to realize various control actions – Guidelines for selection of controller mode.

UNIT III FINAL CONTROL ELEMENTS 9

I/P Converter – Pneumatic and Electric Actuators – Control Valves – Characteristic of Control Valves – Inherent and Installed Characteristics – Valve Body – Commercial Valve Bodies – Control Valve Sizing – Cavitation and Flashing – Selection Criteria.

UNIT IV CONTROLLER TUNING 9

Evaluation Criteria – IAE – ISE – ITAE and ¼ decay ratio – Tuning – Process Reaction Curve Method – Continuous Cycling Method and Damped Oscillation Method.

UNIT V CONTROL SCHEMES 9

Feed-Forward Control – Ratio Control – Cascade Control – Inferential Control – Split-Range Control

L : 45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 Stephanopoulos G, „Chemical Process Control – An Introduction to Theory and Practice", 6th Edition, Prentice Hall of India, New Delhi, 2005.

2 Seborg D.E., Edgar T.F. and Mellichamp D.A, „Process Dynamics and Control",2nd Edition, Wiley John and Sons, 2003

REFERENCES

1 Coughanowr D.R, „Process Systems Analysis and Control", 4th Edition, Tata McGraw - Hill International Edition, New Delhi, 2004.

2 D. P. Eckman, „Automatic Process control", 7th Edition, John Wiley and Sons, NewYork, 1990.

3 Considine D.M, „Process Instruments and Controls Handbook", 2nd Edition, Tata McGraw Hill, New Delhi, 1999.

4 Bela.G.Liptak, Process Control and Optimization, Instrument Engineers Handbook", Volume 2, CRC Press and ISA, 2005

5 Curtis D. Johnson, „Process Control Instrumentation Technology", 8th Edition, Pearson Education, 2006.

COURSE OUTCOMES

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

CO1 To develop mathematical modeling for fundamental processes

CO2 Select suitable controller for a process

CO3 Acquire knowledge about the characteristics and application of control valves

CO4 Understand the various controller tuning methods and its performance

CO5 Analyze the various multi loop controller for complex process

16CS453	PROGRAMMING IN JAVA	L	T	P	C
	(Common to EEE, BME & EIE)	3	0	0	3

UNIT I BASICS **9**

The History and evolution of Java – An Overview of Java – Data Types, Variables and Arrays – Operators – Control Statements.

UNIT II CLASSES AND METHODS **9**

Introducing Classes – A Closer look at Methods and Classes – Inheritance – Packages and Interfaces – Exceptions Handling.

UNIT III MULTITHREADING **9**

Multithreaded Programming – Enumerations – Autoboxing and Metadata – Generics

UNIT IV STRINGS AND APPLETS **9**

String Handling – Input/output: Exploring java.io – Networking – The Applet Class.

UNIT V APPLET WINDOWING TOOLKIT **9**

Event Handling-Introducing the AWT: Working with Windows – Graphics and Text – Using AWT Controls – Layout Managers – Menus.

L : 45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 Herbert Schildt, "Java - The Complete Reference", Seventh Edition, Tata McGraw- Hill, 2008

2. Harvey M. Dietel, "Java How to Program", Seventh Edition, Prentice Hall, 2007.

REFERENCES

1 E. Balagurusamy, "Programming with Java: A primer", Third Edition, Tata McGraw-Hill, 2007.

2 Bruce Eckel, "Thinking in Java", Fourth Edition, Prentice Hall, 2006. ISBN: 978-0131872486

3 Ivor Horton, "Beginning Java 2 JDK", Fifth Edition, Wiley, 2004. ISBN: 978-0-7645-6874-9.

4 Ken Arnold, James Gosling, David Holmes, "The Java Programming Language", Fourth Edition, Prentice Hall Professional Technical Reference

5 Kathy Sierra, Bert Bates, "Head First Java", Second Edition, O'Reilly Media, 2005.

COURSE OUTCOMES

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

CO1 Write the Java programming language fundamentals: its syntax, idioms, patterns and styles.

CO2 Write the essentials of the Java class library.

CO3 Understand the threading control in Java environment

CO4 Know about handling strings and work with applets.

CO5 Logically think and implement any software projects in Java using applets

16GE312 CAREER DEVELOPMENT PROGRAMME VI **L T P C**

(Common to all B.E. / B. Tech. Courses) **1 0 2 2***

UNIT I LINGUISTIC SKILLS **10**

Parts of Speech, Sentences - Simple, Compound & Complex sentences, Logical sequence of words, Reading Comprehension, Paragraph writing, Jumbled words, Jumbled sentences, Error Spotting, Idioms & Phrases, Word Substitution, Synonyms & Antonyms.

UNIT II QUANTITATIVE ABILITY **10**

Number theory, Percentage, Profit loss and discount, Simple and compound interest, Problems on Average & Ages, Ratio & Proportions, Partnership, Mixtures and allegation, Time speed and distance, Time and work, Probability, Permutation and combination, Mensuration, Clocks, Calendars.

UNIT III VERBAL & NON-VERBAL REASONING **10**

Analytical reasoning - Linear, Circular & Complex arrangement, Blood relation, Direction Problems, Decision making.

Logical reasoning - Number and Alpha series, Odd man out, Element series, Logical series, Coding and decoding, Syllogisms, Alphabets Machine Input & Output Coded Inequalities, Puzzles, Cubes, Data sufficiency, Analogy.

Critical reasoning - Statement – Argument & Assumption, Causes & effects, Courses of Action, Inferences.

Non-Verbal reasoning - Insert the missing character, Figure series, Cubes & Dices, Logical Venn diagram.

UNIT IV PERSONALITY DEVELOPMENT & SOFT SKILLS **8**

Body Language – Introduction, Grooming, Body Language - Postures and Gestures, Dressing Etiquettes, Hygiene & Cleanliness, Time Management

Interview Etiquettes – Meaning, Purpose, Interview process and types, checklist – do's and don'ts, Dress code, Self-Introduction.

Resume Building – Introduction, transformation between Resume and CV, Strategy of Resume Writing, Body of the resume, clarity and crispness, format and content.

Group Discussion – Types, Key steps to succeed in Group Discussion, Guidelines – Do's and Don'ts during Group Discussion, the technique of summing up.

UNIT V COMPANY SPECIFIC TRAINING **7**

Company specific training.

L:15 T:0 P:30 Total: 45 PERIODS

TEXT BOOKS

1 John Eastwood, "Oxford Practice Grammar", Oxford.
2 Rajesh Varma, "Fast Track Objective Arithmetic", Arihant Publications.

REFERENCES

1 R.V.Praveen, "Quantitative Aptitude and Reasoning" PHI Publication.
2 R.S.Agarwal, "Quantitative Aptitude for Competitive Examinations", S.Chand & Company Pvt Limited.
3 S.P.Bakshi, "Objective English" Arihant Publications.
4 Edgar Thorpe & Showick Thorpe, "Winning Interviews", Pearson Publications.
5 M.K.Panday, "Analytical Reasoning", Magical Series.

COURSE OUTCOMES

At the end of the course students should be able to

CO1 Communicate well both in oral and written English.
CO2 Solve the complicated problems with the thorough knowledge on the basics.
CO3 Think both critical and logical to solve the problems.
CO4 Be a better personality in their professional and social life.
CO5 Face the recruitment challenges.

16GE314	CAREER DEVELOPMENT PROGRAMME VI	L	T	P	C
	(Common to all B.E. / B. Tech. Courses)	1	0	2	2*

UNIT I QUANTITATIVE ABILITY IV **9**

Time, speed & distance-Average speed- Relative speed- Train problems- Boats and streams- Races, Chain rule, Time and work -Pipes and cisterns.

UNIT II QUANTITATIVE ABILITY V **9**

Permutation & Combination, Probability, Mensuration, Data sufficiency (Quants).

UNIT III VERBAL REASONING III **9**

Machine Input and Output, Coded Inequalities, syllogisms, Problems on Cubes, Data sufficiency(Reasoning).

UNIT IV CRITICAL REASONING **9**

Statement and Argument, Statement and Assumption, Statement and Conclusion, Course of action, Inference, Decision Making.

UNIT V NON- VERBAL REASONING **9**

Figure series, Odd man out, Mirror Image, Water image, Embedded Image, Cubes and Dices, shape construction, Insert the Missing Characters, Analytical reasoning, Logical venn diagram.

L:15 T:0 P:30 Total: 45 PERIODS

TEXT BOOKS

1. Rajesh Varma, "Fast Track Objective Arithmetic", Arihant Publications.
2. BS Sijwali- Indu Sijwali, A New Approach to "Reasoning Verbal, Non-Verbal & Analytical", Arihant Publications.

REFERENCES

1. R.V.Praveen, "Quantitative Aptitude and Reasoning" PHI Publication.
2. R.S.Agarwal, "Quantitative Aptitude for Competitive Examinations", S.Chand & Company Pvt Limited.
3. M.K.Panday, "Analytical Reasoning", Magical Series.
4. Wiley's Quantitative Aptitude Book - P.A. Anand.
5. The Pearson Guide To Quantitative Aptitude For Competitive – Arun Sharma.

COURSE OUTCOMES

At the end of the course students should be able to

CO1 Increase the students knowledge in both analytical and logical reasoning
CO2 Apply the shortcut methods in quantitative Aptitude
CO3 Solve application orientated concepts in quantitative aptitude.
CO4 Improve the quality of the student as a finished product for their corporate life
CO5 Use their logical thinking and analytical abilities to solve Quantitative aptitude questions.

16CS454	JAVA PROGRAMMING LABORATORY	L	T	P	C
	(Common to EEE, BME & EIE)	0	0	4	2

LIST OF EXPERIMENTS

1. Develop Rational number class in Java. Use JavaDoc comments for documentation. Your implementation should use efficient representation for a rational number, i.e. (500 / 1000) should be represented as (½).
2. Develop Date class in Java similar to the one available in java.util package. Use JavaDoc comments.
3. Write a program to perform matrix multiplication with necessary constructors
4. Design a Java interface for ADT Stack. Develop two different classes that implement this interface, one using array and the other using linked-list. Provide necessary exception handling in both the implementations.
5. Design a Vehicle class hierarchy in Java. Write a test program to demonstrate polymorphism.
6. Design a generic Class that support different data type.
7. Design classes for Currency, Rupee, and Dollar. Write a program that randomly generates Rupee and Dollar objects and write them into a file using object serialization. Write another program to read that file, convert to Rupee if it reads a Dollar, and while leave the value as it is if it reads a Rupee.
8. Construct an applet that includes AWT components and perform actions on the component used.
9. Design a scientific calculator using event-driven programming paradigm of Java.
10. Write a multi-threaded Java program to print all numbers below 100,000 that are both prime and fibonacci number (some examples are 2, 3, 5, 13, etc.). Design a thread that generates prime numbers below 100,000 and writes them into a pipe. Design another thread that generates fibonacci numbers and writes them to another pipe. The main thread should read both the pipes to identify numbers common to both.

MAJOR EQUIPMENTS / SOFTWARE REQUIRED

Hardware

1. LAN System with 33 node (or) standalone PCs-33 Nos
2. Printer – 3 Nos

Software

1. Java/J2SE compiler .NetBeans
2. MySQL

L : 0 T: 0 P:60 Total:60 PERIODS

COURSE OUTCOMES

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

CO1 Construct basic programs based on concepts of Object Oriented programming using Java Language

CO2 Deploy programs using Inheritance, Java interfaces, Packages and Nested Class.

CO3 Generate a standalone and applet applications using Java.

CO4 Develop GUI based programs using Applet, AWT & Swing for a computer program to interact.

CO5 Develop applications using networking and JDBC concepts.

16EI326 SYSTEM DESIGN AND DEVELOPMENT LABORATORY L T P C

0 0 2 1

LIST OF EXPERIMENTS

1. Bottle filling system using PLC
2. Vending Machine
3. Level Process
4. Flow process
5. Pressure process
6. Temperature process
7. Count and packing system
8. Bottle crushing and packing machine
9. Voice controlled home automation
10. SMS controlled home automation
11. Building Automation-Light and Fan
12. RFID based data logger
13. Pills dispensary machine
14. Automated Blood pressure measurement
15. Automatic light dimmer
16. Automatic street light (solar based)
17. Automatic water dripper
18. Analytical Instruments
19. Image Intensifier
20. Toll Automation

MAJOR EQUIPMENTS / SOFTWARE REQUIRED

- Programmable Logic controller
- Programmable Logic controller Software
- DAQ card
- Filling /Draining System
- Traffic Light Controller
- DC Motor
- Personal computer
- Thermal Process, Level Process and Flow Process stations
- Smart Transmitter

L : 0 T: 0 P: 30 Total: 30 PERIODS

COURSE OUTCOMES

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

CO1 Understand programming of PLC

CO2 Working with industrial automation system

CO3 Design and implement control schemes in PLC

CO4 Interface field devices with PLC

CO5 Read parameter of PLC

16EI327	PROCESS CONTROL SYSTEM LABORATORY	L	T	P	C
		0	0	2	1

LIST OF EXPERIMENTS

1. Operation of interacting and non-interacting systems
2. Responses of different order processes with and without transportation lag
3. Response of ON-OFF controller for any one process
4. Characteristics of control valve with and without positioned
5. Closed loop response of flow control loop
6. Closed loop response of level control loop
7. Closed loop response of temperature control loop
8. Closed loop response of pressure control loop
9. Tuning of controllers
10. Complex control system (ratio / cascade / feed forward)

MAJOR EQUIPMENTS / SOFTWARE REQUIRED

- Two tank system with provision for making them as interacting and non interacting
- Two tank system with provision for transportation delay (Non – interacting process)
- Electronic PID controller Source for generating step and ramp inputs
- Control valve trainer
- Flow process station
- Level process station
- Temperature process station
- Pressure process station
- Cascade control system trainer

L : 0 T: 0 P: 30 Total:30 PERIODS

COURSE OUTCOMES

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

CO1	Understand the concepts of various controller designs and methods of controller tuning
CO2	Develop mathematical model of a process and its control for various Process Variables
CO3	Understand the concepts of various complex control schemes, characteristics and application of Actuators

16GE302 ENGINEERING ECONOMICS AND COST ANALYSIS L T P C

(Common to all B.E. / B. Tech. Courses) **3 0 0 3**

UNIT I BASIC ECONOMICS 9

Definition of economics - nature and scope of economic science - nature and scope of managerial economics - basic terms and concepts - goods - utility - value - wealth - factors of production - land - its peculiarities - labour - economies of large and small scale - consumption -wants - its characteristics and classification - law of diminishing marginal utility – relation between economic decision and technical decision.

UNIT II DEMAND AND SCHEDULE 9

Demand - demand schedule - demand curve - law of demand - elasticity of demand - types of elasticity - factors determining elasticity - measurement – its significance - supply – supply schedule - supply curve - law of supply - elasticity of supply - time element in the determination of value - market price and normal price - perfect competition - monopoly – monopolistic competition.

UNIT III ORGANISATION 9

Forms of business - proprietorship - partnership - joint stock company - cooperative organization - state enterprise - mixed economy - money and banking - banking - kinds - commercial banks - central banking functions - control of credit - monetary policy - credit instrument.

UNIT IV FINANCING 9

Types of financing - Short term borrowing - Long term borrowing – Internal generation of funds - External commercial borrowings - Assistance from government budgeting support and international finance corporations - analysis of financial statement – Balance Sheet - Profit and Loss account - Funds flow statement.

UNIT V COST AND BREAK EVEN ANALYSES 9

Types of costing – traditional costing approach - activity base costing - Fixed Cost – variable cost – marginal cost – cost output relationship in the short run and in long run – pricing practice– full cost pricing – marginal cost pricing – going rate pricing – bid pricing – pricing for a rate of return – appraising project profitability –internal rate of return – pay back period – net present value – cost benefit analysis – feasibility reports – appraisal process – technical feasibility economic feasibility – financial feasibility. Break even analysis - basic assumptions – break even chart – managerial uses of break even analysis.

L:45 T: 0 P:0 Total: 45 PERIODS

TEXT BOOKS

1 Dewett K.K. & Varma J.D., Elementary Economic Theory, S Chand & Co., 2006.
2. Sharma JC "Construction Management and Accounts" Satya Prakashan, New Delhi, 2006.

REFERENCES

1 Barthwal R.R., Industrial Economics - An Introductory Text Book, New Age, 2007.
2 Jhingan M.L., Micro Economic Theory, Konark,1989.
3 Samuelson P.A., Economics - An Introductory Analysis, McGraw Hill.

COURSE OUTCOMES

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

CO1 Know the basic terms and concepts of economic.
CO2 Understand the major capability and limitations of cash flow analysis for proposed capital investment.
CO3 Recognize, formulate, analyze and solve cash flow models in practical situations.
CO4 Develop the ability to account for time value of money using engineering economy factors and formulas, as well as implication and importance of considering taxes, depreciation and inflation.
CO5 Evaluate engineering alternatives by economic analysis techniques and models.

16EI420 INSTRUMENTATION SYSTEM DESIGN LABORATORY L T P C

0 0 4 3

LIST OF EXPERIMENTS

1. Design of Instrumentation amplifier
2. Design of Active Filters
3. Design of Regulated Power Supply and design of V/I and I/V converters
4. Design of Cold – junction compensation circuit for thermocouples
5. Design of signal conditioning circuit for Strain Gauge and RTD
6. Design of Orifice plate and Rotameter
7. Control Valve Sizing
8. Design of PID controller
9. Piping and Instrumentation Diagram – case study.
10. Preparation of documentation of instrumentation project and project scheduling (process flow sheet, instrument index sheet and instrument specifications sheet, job scheduling, installation procedures and safety regulations).

MAJOR EQUIPMENTS / SOFTWARE REQUIRED

- Monolithic Instrumentation amplifier
- Operational amplifiers
- IC 7805 and resistors, diodes, capacitors Operational amplifier & Loop analyzer
- Thermocouple & RTD Opamp
- Bonded strain gauge, Loads, Opamp
- Pump and reservoir Pipeline with orifice plate Collecting tank
- Linear control valve, ON/OFF control valve, Air regulator, Rotameter, Pump
- IC 741, CRO, Bread board, Signal generator (PID) Microprocessor kit with ADC and DAC section

L : 0 T: 0 P: 45 Total: 45 PERIODS

COURSE OUTCOMES

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

CO1	Ability to understand and analyze Instrumentation systems and their applications to various industries
CO2	Design various signal conditioning circuits for appropriate application
CO3	Understand and analyze Instrumentation system by standard Piping & Instrumentation diagrams
CO4	Select optimum control parameters using control techniques

16EI421	PROJECT WORK – PHASE I	L	T	P	C
		0	0	4	2

The project involves the following:

1. Identification of a real life problem in thrust areas
2. Developing a mathematical model for solving the above problem
3. Finalisation of system requirements and specification
4. Proposing different solutions for the problem based on literature survey
5. Future trends in providing alternate solutions
6. Consolidated report preparation of the above

L: 0 T: 0 P: 60 Total : 60 PERIODS

16EI411	POWER PLANT INSTRUMENTATION	L	T	P	C
		3	0	0	3

UNIT I OVERVIEW OF POWER GENERATION 9

Importance of Instrumentation in Power Generation – Methods of Power Generation: Hydro, Nuclear, Steam, Solar, Wind –Basic Building Block -Operation – P&I diagram of boiler – Cogeneration of power.

UNIT II PARAMETERS OF POWER PLANT AND ITS MEASUREMENT 9

Electrical and non electrical parameter measurement - Measurement of Feed Water Flow, Air Flow , Steam Flow and Coal Flow – Boiler Drum Level Measurement – Steam Pressure and Temperature Measurement – Turbine Speed and Vibration Measurement – Radiation Detector - smoke density measurement – dust monitor.

UNIT III ANALYZERS IN POWER PLANTS 9

Flue Gas Oxygen Analyzer – Analysis of Impurities in Feed Water and Steam – Dissolved Oxygen Analyzer – Chromatography – pH Meter – Fuel Analyzer –Spectrum analyzer - Pollution Monitoring Instruments.

UNIT IV BOILER CONTROL 9

Boiler Control – Combustion control – air/fuel ratio control – furnace draft control – drum level control – main steam and reheat steam temperature control – super heater control – deaerator control – flue gas dew point control - distributed control system in power plants – interlocks in boiler operation.

UNIT V CONTROL OF TURBINE 9

Types of Steam Turbines – Turbine Governing System – Speed, vibration, shell temperature monitoring and control – steam pressure control – lubricant oil temperature control – cooling system.

L : 45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1. Everett Woodruff, Herbert Lammers, Thomas Lammers, „Steam Plant Operation", 9th Edition, McGraw Hill, 2012
2. Rajput R.K., A Text book of Power plant Engineering, Lakshmi Publications, 5th Edition, 2013
3. Sam G. Dukelow, The control of Boilers, instrument Society of America, 1991.

REFERENCES

1. Liptak B.G., Instrumentation in Process Industries, Chilton Book Company, 2005
2. Jain R.K., Mechanical and Industrial Measurements, Khanna Publishers, New Delhi, 4th Edition, 2010.
3. P.K.Nag, Power plant Engineering", Tata McGraw-Hill Education, 3rd edition, 2007.
4. Dr.K.Tamilmani, „Power Plant Instrumentation", Sams Publishers, 2011.
5. Krishnaswamy.K and Ponnibala.M., "Power Plant Instrumentation:, PHI Learning Pvt. Ltd., NewDelhi,2nd Edition, 2011.

COURSE OUTCOMES

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

CO1 To provide an overview of power generation methods
CO2 To educate on the important power plant measurements and devices
CO3 To understand the importance of analysers in power plant
CO4 To educate on Boiler control techniques
CO5 To acquire knowledge on the turbine control techniques

16EI426	PROJECT WORK – PHASE II	L	T	P	C
		0	0	20	10

The project involves the following:

Preparing a project - brief proposal including

1. Problem identification
2. A statement of system / process specifications proposed to be developed (block diagram / concept tree)
3. List of possible solutions including alternatives and constraints
4. Cost benefit analysis
5. Time line of activities

A report highlighting the design finalization [based on functional requirements & standards (if any)

A presentation including the following:

1. Implementation phase (hardware / software / both)
2. Testing & validation of the developed system
3. Learning in the Project
4. Consolidated report preparation

L: 0 T: 0 P: 300 Total : 300 PERIODS

PROFESSIONAL ELECTIVE – I

16EI350	ANALYTICAL INSTRUMENTATION	L	T	P	C
		3	0	0	3

UNIT I COLORIMETRY AND SPECTROPHOTOMETRY 9

Spectral methods of analysis – Beer-Lambert law – Colorimeters – UV –Visible spectrophotometers – Single and double beam instruments – Sources and detectors – IR Spectrophotometers – Types – Attenuated total reflectance flame photometers – Atomic absorption spectrophotometers – Sources and detectors – FTIR spectrophotometers – Flame emission photometers – Fluorescence spectrophotometer

UNIT II CHROMATOGRAPHY 9

Chromatography- Different techniques – Gas chromatography – Detectors – Liquid chromatographs – Applications – High-pressure liquid chromatographs – Applications.

UNIT III INDUSTRIAL GAS ANALYZERS AND POLLUTION MONITORING INSTRUMENTS 9

Types of gas analyzers – Oxygen, Nitrogen oxide (NO2) and Hydrogen Sulphide (H2S) types - IR analyzers - thermal conductivity analyzers - analysis based on ionization of gases – Air pollution due to carbon monoxide, hydrocarbons, nitrogen oxides, sulphur dioxide estimation - Dust and smoke measurements.

UNIT IV pH METERS AND DISSOLVED COMPONENT ANALYZER 9

Principle of pH measurement, glass electrodes, hydrogen electrodes, reference electrodes, selective ion electrodes, ammonia electrodes, biosensors, dissolved oxygen analyzer – Sodium analyzer – Silica analyzer.

UNIT V RADIOCHEMICAL, MAGNETIC RESONANT AND MICROSCOPIC TECHNIQUES 9

Nuclear radiations-Detectors-GM counter-Proportional counter-Solid state detectors-Gamma cameras. X-ray spectroscopy – Detectors– Diffractometers – Absorption meters – Detectors.NMR:-Basic principles, NMR spectrometer and Application. Scanning Electron Microscope (SEM):- Basic principles, Instrumentation and applications. Transmission Electron Microscope (TEM):– Basic principles – Instrumentation and applications. Mass spectrometers: – Different types and Applications.

L : 45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1. R.S. Khandpur, “Handbook of Analytical Instruments”, Tata McGraw Hill publishing Co. Ltd., 2nd Edition, 2013.
2. G.W. Ewing, “Instrumental Methods of Chemical Analysis”, McGraw Hill, 2003

REFERENCES

1. Robert D. Braun, “Introduction to Instrumental Analysis”, McGraw Hill, Singapore, revised edition 2006
2. B.G.Liptak,“Instrument Engineers Handbook Volume 1- Process Measurement and Analysis”, CRC Press, 4thEdition, 2005
3. R.K. Jain, “Mechanical and Industrial Measurements”, Khanna Publishers, New Delhi, Revised edition 2013
4. H.H. Willard, L.L. Merritt, J.A. Dean, F.A. Settle, “Instrumental Methods of Analysis”, CBS publishing & distribution, 1995.Reprint 2012
5. John H.Nelson, Nuclear Magnetic Resonance Spectroscopy, Prentice Hall/PearsonEducation,2003

COURSE OUTCOMES

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

- **CO1** Understand various techniques and methods of analysis which occur in the various regions of the spectrum
- **CO2** Comprehend the basic concepts, principles and terms of chromatographic methods
- **CO3** Identify the environmental problems and issues on pollution in the environment
- **CO4** Analyze the working of pH meters and various analyzers
- **CO5** Understand the concepts of radiation detectors and NMR spectrometers.

16EE320	EMBEDDED SYSTEMS	L	T	P	C
		3	0	0	3

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS 9

Introduction to Embedded Systems – The build process for embedded systems- Structural units in Embedded processor , selection of processor & memory devices- DMA – Memory management methods- Timer and Counting devices, Watchdog Timer, Real Time Clock, In circuit emulator, Target Hardware Debugging

UNITII EMBEDDED NETWORKING 9

Embedded Networking: Introduction, I/O Device Ports & Buses– Serial Bus communication protocols - RS232 standard – RS422 – RS485 - CAN Bus -Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I2C) –need for device drivers

UNIT III EMBEDDED FIRMWARE DEVELOPMENT ENVIRONMENT 9

Embedded Product Development Life Cycle- objectives, different phases of EDLC, Modelling of EDLC; issues in Hardware-software Co-design, Data Flow Graph, state machine model, Sequential Program Model, concurrent Model, object oriented Model

UNIT IV RTOS BASED EMBEDDED SYSTEM DESIGN 9

Introduction to basic concepts of RTOS- Task, process & threads, interrupt routines in RTOS, Multiprocessing and Multitasking, Preemptive and non-preemptive scheduling, Task communication shared memory, message passing-, Inter process Communication – synchronization between processes-semaphores, Mailbox, pipes, priority inversion, priority inheritance, comparison of Real time Operating systems: Vx Works

UNIT V EMBEDDED SYSTEM APPLICATION DEVELOPMENT 9

Case Study: Washing Machine- Automotive Application- Smart card System Application,- Personal Digital Assistant, Elevator controller. Introduction to IOT.

L : 45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 Rajkamal, 'Embedded System-Architecture, Programming, Design', McGraw Hill, 2013.
2. Lyla B Das," Embedded Systems-An Integrated Approach", Pearson, 2013.

REFERENCES

1 Shibu. K.V, "Introduction to Embedded Systems", Tata Mcgraw Hill,2009.
2 Elicia White," Making Embedded Systems", O' Reilly Series,SPD,2011.
3 Peckol, "Embedded system Design", John Wiley & Sons,2010.
4 Han-Way Huang, "Embedded system Design Using C8051", Cengage Learning,2009.
5 Rajib Mall "Real-Time systems: Theory and Practice" Pearson Education, 2007.

COURSE OUTCOMES

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

CO1 Ability to understand the concepts of various embedded development strategies
CO2 Develop serial and parallel communication based applications
CO3 Understand outline of RTOS concepts
CO4 Apply the hardware and software knowledge to design and develop simple firmware modules.
CO5 To Develop various models related to application of Embedded Systems

16EI351	DIGITAL SYSTEM DESIGN	L	T	P	C
		3	0	0	3

UNIT I DIGITAL LOGIC FAMILIES 9

TTL – CMOS – NMOS - Dynamic MOS – ECL – I^2L - Operating Conditions – Parameters - Power Supply Grounding Considerations for Digital ICs - TTL-to-CMOS Interface - CMOS-to-TTL interface.

UNIT II PROGRAMMABLE LOGIC DEVICES 9

Programmable Logic Arrays - Programmable Array Logic - Realizing Logic Function using Multiplexers – Decoders – ROM – PLA – PAL - Design of Sequential Networks using PAL, PLA – Programmable Gate Arrays – FPGA, CPLD.

UNIT III DIGITAL MEMORIES 9

Role of Memory in a System – Memory Types and Terminology – ROM – Types of ROM – RAM – SRAM – DRAM – Expanding Word Size and Capacity – Applications.

UNIT IV CASE STUDIES 9

Multiplexing Displays – Frequency Counters – Time Measurement – Digital Voltmeter – PRBS Generator – Interfacing with Flash Memory.

UNIT V DESIGN FOR TESTABILITY 9

Testability – Ad hoc Design for Testing Techniques – Controllability and Observability by means of Scan Registers – Generic Scan Based Design – Board Level and System Level DFT Approaches.

L : 45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 Donald P. Leach, Albert Paul Malvino, Goutam Suha, "Digital Principles and Applications", 7th Edition, Tata McGraw – Hill, 2011.

2 Miron Abramonici, Melvin. A. Rrewer, Arthur D. Friedman, "Digital System Testing and Testable Design", Jaico publishing House, 2006.

REFERENCES

1 Theodore F. Bogart, "Introduction to Digital Circuits", Tata McGraw – Hill International Education, 1992

2 Ronald J.Tocci, Neal .S. Widmer, "Digital System Principles and Applications", 8th Edition, Pearson Education, Asia, 2002.

3 Morris Mano. M, "Digital Design", 3rd Edition, Pearson Education, New York, 2007.

4 Donald D.Givone, "Digital Principles and Design", Tata McGraw – Hill, 2007.

5 Charles H.Roth, "Fundamentals Logic Design", 4th Edition, Jaico Publishing, 2002.

COURSE OUTCOMES

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

CO1 Acquire knowledge on Digital Logic Families.

CO2 Design sequential networks using programmable logic devices

CO3 Acquire knowledge on digital memories in detail with their applications.

CO4 Design various digital systems

CO5 Understand the testing techniques

16EC358	DIGITAL IMAGE PROCESSING (Common to ECE, EIE and MCT)	L	T	P	C
		3	0	0	3

UNIT-I DIGITAL IMAGE FUNDAMENTALS 9

Introduction – Origin – Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - color image fundamentals – RGB,HSI models. Two – dimensional mathematical preliminaries, 2D transforms – DFT and DCT.

UNIT-II IMAGE ENHANCEMENT 9

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering – **Frequency Domain:** Introduction to Fourier Transform – Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters. Color image enhancement.

UNIT-III IMAGE RESTORATION AND SEGMENTATION 9

Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering **Segmentation:** Detection of Discontinuities–Edge Linking and Boundary detection – Region based segmentation- Morphological processing- erosion and dilation.

UNIT-IV WAVELETS AND IMAGE COMPRESSION 9

Wavelets – Subband coding - Multiresolution expansions **Compression:** Fundamentals – Image Compression models – Error Free Compression – Variable Length Coding – Bit-Plane Coding – Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Compression Standards - JPEG and MPEG standards.

UNIT-V IMAGE REPRESENTATION AND RECOGNITION 9

Boundary representation – Chain Code – Polygonal approximation, signature, boundary segments – Boundary description – Shape number – Fourier Descriptor, moments- Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

L : 45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 Rafael C. Gonzalez, Richard E Woods, “Digital Image Processing”, Third edition, Pearson Education, New Delhi, 2010

2. Anil K. Jain, “Fundamentals of Digital Image Processing”, PHI Learning Pvt. Ltd., 2011

REFERENCES

1 Rafael C. Gonzalez, Richard E Woods, Steven L.Eddins, “Digital Image Processing using MATLAB”, Third edition, Tata McGraw Hill Pvt. Ltd., 2011

2 William K Pratt, “Digital Image Processing”, John Wiley & sons, New York, 2004

3 Malay K Pakhira, “Digital Image Processing and Pattern Recognition’, First Edition, PHI Learning Pvt. Ltd., 2011

COURSE OUTCOMES

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

CO1 Discuss digital image fundamentals

CO2 Apply image enhancement and restoration techniques

CO3 Test the image compression and segmentation techniques.

CO4 Evaluate the wavelet transforms and image compression techniques

CO5 Analyze the various image representation and recognition techniques

PROFESSIONAL ELECTIVE – II

16EC331	COMMUNICATION ENGINEERING (Common to EEE, EIE)	L	T	P	C
		3	0	0	3

UNIT I ANALOG COMUNICATION **9**

Introduction to analog communication, Modulation - Need for modulation, Amplitude modulation and demodulation, frequency modulation and demodulation, Super heterodyne radio receiver, Frequency division multiplexing.

UNIT II DIGITAL COMMUNICATION **9**

Model of digital communication system, Sampling theorem, Reconstruction of message from its samples, Pulse Amplitude modulation, quantization, PCM, DM, ASK, FSK, PSK, applications of Digital communication.

UNIT III SOURCE CODES, LINE CODES & ERROR CONTROL **9**

Primary communication – entropy, properties, source coding: Shannon Fano, Huffman coding, Line codes: NRZ, RZ, AMI, error control codes and applications: convolutions & block codes.

UNIT IV MULTIPLE ACCESS TECHNIQUES **9**

Spread Spectrum , Multiple Access techniques: FDMA, TDMA, CDMA, Applications in wired and wireless communication systems, Advantages.

UNIT V SATELLITE, OPTICAL FIBER **9**

Orbits , types of satellites, Satellite frequency bands, link establishment, multiple access techniques used in satellite communication, block diagram of earth station, INTELSAT and INSAT series. Fibers – types, sources, detectors, optical link.

L : 45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 Wayne Tomasi, ‘Advanced Electronic Communication Systems’, Pearson Education, 6th Edition, 2004

2 Roy Blake, ‘Electronic Communication Systems’, Thomson Delmar, 2nd Edition, 2002.

REFERENCES

1 Kennedy and Davis “Electronic communication systems” Tata McGraw hill, 4th Edition, 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 Miller, ‘Modern Electronic Communication’, Prentice Hall of India, 2003.

COURSE OUTCOMES

At the end of the course students should be able to

CO1 Understand the fundamentals of Analog communication

CO2 Classify the different methods of Digital communication

CO3 Analyze the concepts of source and line coding techniques

CO4 Understand various multiple access techniques

CO5 Access the concepts of satellite and optical fibres

16IT420	SOCIAL NETWORK ANALYSIS	L	T	P	C
		3	0	0	3

UNIT I INTRODUCTION TO SOCIAL NETWORK ANALYSIS 9

Introduction to social Networks, Semantic webs - Development of Semantic Web – Emergence of the Social Web - Network analysis - Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis - Electronic discussion networks, Blogs and online communities, Web-based networks

UNIT II MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION 9

Ontology-based Knowledge Representation – Ontology languages for the Semantic Web – RDF and OWL - Modelling and aggregating social network data - State-of-the-art in network data representation, Ontological representation of social individuals, Ontological representation of social relationships, Aggregating and reasoning with social network data, Advanced Representations.

UNIT III WEB CONTENT MINING AND LINKAGE MINING 9

Web search- Activities on Web Archiving- web crawling- Personalized Web Search- Latent Semantic Indexing- Automatic topic extraction from Web Documents- Opinion Search and Opinion Spam- Web Search and Hyperlink- Co-citation and Bibliographic Coupling- Page Rank and HITS Algorithms- Web Community Discovery

UNIT IV WEB USAGE MINING 9

Modelling Web user Interests using Clustering – Probabilistic Latent Semantic Analysis Model-Constructing User Access Pattern and Identifying Latent Factor with PLSA – Co-Clustering analysis of weblogs using Bipartite Spectral Projection Approach

UNIT V EXTRACTING AND ANALYZING WEB SOCIAL NETWORKS 9

Modeling Web User Interests using Clustering - Types of Changes - Evolution Metrics - Web Archives and Graphs - Evolution of Web Community Charts - Temporal Analysis on Semantic Graph using Three-Way Tensor Decomposition - Analysis of Communities and Their Evolutions in Dynamic Networks

L : 45 T: 0 P:0 Total: 45 PERIODS

TEXT BOOKS

1. Peter Mika, "Social networks and the Semantic Web", Springer, 1st edition 2007.
2. Guandong Xu , Yanchun Zhang and Lin Li, "Web Mining and Social Networking Techniques and applications", Springer, 1st edition, 2011.

REFERENCES

1. Borko Furht, "Handbook of Social Network Technologies and Applications", Springer, 1st edition, 2010.
2. Dion Goh and Schubert Foo, "Social information retrieval systems: emerging technologies and applications for searching the Web effectively", IGI Global snippet, 2008.
3. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, "Collaborative and social information retrieval and access: techniques for improved user modelling", IGI Global snippet, 2009.
4. John G. Breslin, Alexandre Passant and Stefan Decker, "The Social Semantic Web", Springer, 2009.

COURSE OUTCOMES

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

CO1 Analyze the development of social networks

CO2 Become Master in modelling, aggregating and knowledge representation of Semantic Web

CO3 Evaluate the concepts of web content mining and linkage mining.

CO4 Know about the usage of web mining in industry standards

CO5 Understand the concepts of Extracting and Analyzing Web Social Networks

16EI360	FIBRE OPTICS AND LASER INSTRUMENTS	L	T	P	C
		3	0	0	3

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 – Fiber Termination – Fiber Drawing - Optical Sources – Optical Detectors.

UNIT II INDUSTRIAL APPLICATIONS OF OPTICAL FIBRES 9

Fibre Optic Sensors – Fibre Optic Instrumentation System – Different Types of Modulators – Interferometric Method for 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 APPLICATIONS 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 – Laser Safety.

L : 45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 R.P.Khare, “Fiber Optics and Optoelectronics”, Oxford University Press, 2013

2 John F. Read, “Industrial Applications of Lasers”, Academic Press, 2012

REFERENCES

1 G. Keiser, “Optical Fiber Communications”, Tata McGraw Hill, 2010.

2 J. Wilson and J.F.B. Hawkes, “Introduction to Opto Electronics”, Prentice Hall of India, 2003.

3 J.M. Senior, “Optical Fiber Communication – Principles and Practice”, Prentice Hall of India, 2010

COURSE OUTCOMES

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

CO1 Acquire knowledge about the properties of fiber optics

CO2 Apply optical fibres for industrial applications

CO3 Understand the operation of laser.

CO4 Apply laser for industrial applications

CO5 Justify the use of laser in medical and hologram applications

16EC341 / 16EC332	DIGITAL SIGNAL PROCESSING	L	T	P	C
	(Common to EEE, EIE)	3	0	0	3

UNIT I SIGNALS AND SYSTEMS 9

Classification of signals – Continuous and Discrete – Periodic – Energy and Power – Mathematical representation of signals – Sampling technique – Quantization – Quantization error – Nyquist rate –Classification of systems – continuous and discrete – Linear – Causal – Stable – Dynamic – Recursive – Time variant

UNIT II DISCRETE FOURIER TRANSFORM & COMPUTATION 9

DFT and its properties – Circular convolution-Section convolution: overlap save and overlap add method – FFT algorithm – FFT using radix-2 – Butterfly structure – DIT algorithm – DIF algorithm.

UNIT III IIR FILTER DESIGN 9

Butterworth filter design – Frequency transformation technique – Invariance – Bilinear transformation - LPF – HPF – BPF - BRF - Filter design using frequency translation - Structures realization of IIR.

UNIT IV FIR FILTER DESIGN 9

Linear Phase FIR filter – Filter design using windowing techniques - Rectangular Window - Hamming Window - Hanning Window - Frequency sampling techniques – Structures realization of FIR.

UNIT V APPLICATION OF DIGITAL SIGNAL PROCESSOR 9

Introduction to digital signal processor-MAC configuration-Basic architecture-Von-Neumann architecture-Harvard architecture-Modified Harvard architecture-Cache memory-Pipelining- Pipeline structure processor-Computer configuration-RISC-CISC-Addressing modes- Study of TMS320C3X (Quantitative analysis).

L : 45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 Poornachandra and Sasikala, “Digital Signal Processing”, Tata McGraw-Hill Publishing Co.Ltd., New Delhi, 2015.

2 Sanjit K. Mitra, “Digital Signal Processing - A Computer Based Approach”, Tata McGraw-Hill Publishing Co.Ltd., New Delhi, 3rd Edition 2009.

REFERENCES

1 Alan V. Oppenheim, Ronald W. Schafer and John R. Buck, “Discrete-Time Signal Processing”, Pearson Education, 2003.

2 Salivahanan, S., Vallavaraj, A. and Gnanapriya,C, “Digital Signal Processing”, Tata McGraw Hill, 2003.

3 Proakis, J.G. and Manolakis, D.G., “Digital Signal Processing Principles, Algorithms and Applications”, Pearson Education / Prentice Hall of India, 2003.

4 Ramesh Babu,”Digital Signal Processing, SciTech Publications (India) Pvt.Ltd.

5 Hayes M.H , “Digital Signal Processing”, Schaum’s Outlines, Tata McGraw Hill, New Delhi,2007.

COURSE OUTCOMES

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

CO1 Represent the signals mathematically and understand the fundamental properties of signals and systems
CO2 Compute the linear and circular convolution of discrete-time signal
CO3 Design and realize FIR and IIR filter for diversified applications
CO4 Design and realize FIR for diversified applications
CO5 Relate the architectures, addressing modes and instruction set of a Digital Signal Processor

PROFESSIONAL ELECTIVE – III

16GE303	TOTAL QUALITY MANAGEMENT	L	T	P	C
	(Common to all B.E. / B. Tech. Courses)	3	0	0	3

UNIT I INTRODUCTION **9**

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Quality statements - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, and Customer retention - Costs of quality.

UNITII TQM PRINCIPLES **9**

Leadership - Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Quality circles Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

UNIT III STATISTICAL PROCESS CONTROL (SPC) **9**

Statistical fundamentals – Measures of central Tendency and Dispersion - Population and Sample, Control Charts for variables and attributes, Industrial Examples. Process capability. Concept of six sigma – New seven Management tools.

UNIT IV TQM TOOLS **9**

Bench marking -Reason to bench mark, Bench marking process - FMEA - Stages, Types. Quality Function Deployment (QFD) - House of Quality - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.

UNIT V QUALITY SYSTEMS **9**

Need for ISO 9000 and Other Quality Systems - ISO 9001-2015 Quality System - Elements, Implementation of Quality System Documentation, Quality Auditing - QS 9000 – BS-OHSAS 18001: 2007, ISO 20000, ISO 22000 IATF 16949: 2016, ISO 14001:2015, AS9100– Concept, Requirements and Benefits- Case studies.

L:45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 Dale H. Besterfiled, "Total Quality Management", Third Edition, Pearson Education Asia, Indian Reprint, 2016.
2. SubburajRamasamy“ Total Quality Management” Tata Mcg raw hill edition, 2015.

REFERENCES

1 Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2010.
2 James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, First Indian Edition, Cengage Learning, 2012. .
3 Dr S. Kumar, “Total Quality Management”, Laxmi Publications Ltd., New Delhi 2006.
4 P. N. Muherjee, “Total Quality Management”, Prentice Hall of India, New Delhi, 2015.
5 Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2010.

COURSE OUTCOMES

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

CO1 State about the recent techniques followed in quality approach.
CO2 Improve Leadership Skills.
CO3 Implement the Concepts of SPC Tools in Industrial Activity.
CO4 Examine the TQM Tools in Several Engineering fields.
CO5 Explain about the ISO and QS certification process and its need for the industries.

16GE304	PRINCIPLES OF MANAGEMENT	L	T	P	C
	(Common to all B.E. / B. Tech. Courses)	3	0	0	3

UNIT I INTRODUCTION TO MANAGEMENT 9

Management: Definition - Evolution of Management Studies –Nature, Functions, Levels and role of management - Basic Principles and Process of Management - Management vs. Administration – Taylor & Fayol's contribution to Management - Role of Managers.

UNIT II PLANNING 9

Planning: Basic types of planning – Characteristics of a good plan- Features - Planning process- Obstacles in planning - MBO, Policy - Policy formulation - Types of policies - Forecasting, Process, Importance – Decision making process.

UNIT III ORGANISING 9

Organization: Need - forms of organization - features of a good organization. Departmentation –- manuals - span of management, factors affecting span of management – delegation of authority and responsibility - centralization and decentralization.

UNIT IV STAFFING & DIRECTING 9

Staffing: Meaning, Nature, Need, and Process. Directing - Characteristics, Importance and Techniques of directing. Event & Time Management - Scope, Importance - Coordination - Need for coordination.

UNIT V CONTROLING 9

Concept of Control – Importance of control- Essentials of control system - Process of control – Communication - Process of Communication - Types - Barriers - Management Information Systems.

L:45 T:0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 Harold Koontz, and Weihrich, 'Essential of Management' 8th Edition, Tata Mc Graw Hill Education, Delhi, (2010) .

2. Tripathy.P.C and Reddy.P.N., 'Higher Principles of Management' Tata Mc-Graw Hill Publishing Company limited, New Delhi (2011).

REFERENCES

1 Stephen.P.Robbins, Mary coulter, NeharikaVohra 'Management', 10th Edition, Tata Mc-Graw Hill Publishing Company limited, New Delhi (2010).

2 Glyn James, 'Advanced Modern Engineering Mathematics', Third edition-Pearson Education (2011).

3 VSP Rao, V.Hari Krishna, 'Management, Excel Books (2010).

4 Dr.Kumkum Mukherjee, 'Principles of Management, 2nd Edition, Tata Mc Graw Hill, (2009).

COURSE OUTCOMES

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

CO1 Discuss and communicate the management evolution and how it will affect future managers.

CO2 Explain how organizations adapt to an uncertain environment and identify techniques managers use to influence and control the internal environment.

CO3 Practice the process of management's four functions: planning, organizing, leading, and controlling.

CO4 Use appropriate methods of communication in the Business Environment.

CO5 Gather and analyze both qualitative and quantitative information to isolate issues and formulate best control methods.

16GE305	INTELLECTUAL PROPERTY RIGHTS	L	T	P	C
	(Common to all B.E. / B. Tech. Courses)	3	0	0	3

UNIT I INTRODUCTION **9**

Meaning, Relevance, Business Impact, Protection of Intellectual Property - Copyrights, Trademarks, Patents, Designs, Utility Models, Trade Secrets and Geographical Indications.

UNIT II PATENTS **9**

Concept of Patent - Product / Process Patents & Terminology - Duration of Patents- Law and Policy Consideration Elements of Patentability - Procedure for Filing of Patent Application and types of Applications - Ownership and Maintenance of Patents - Assignment and licensing of Patents.

UNIT III TRADEMARK **9**

The rationale of protection of trademark as (a) an aspect of commercial and (b) of consumer rights - Definition and concept of Trademarks - Different kinds of marks (brand names, logos, signatures, symbols, well known marks, certification marks and service marks) - Non Registrable Trademarks - Procedure for Registration of Trademarks.

UNIT IV COPYRIGHT **9**

Nature of Copyright - Author & Ownership of Copyright - Rights Conferred by Copyright - Assignment, Transmission, Licensing of Copyrights - Copyright pertaining to Software/Internet and other Digital media.

UNIT V INDUSTRIAL DESIGNS **9**

What is a Registrable Design - Novelty & Originality - Procedure for Registration of Designs - Copyright under Design - Assignment, Transmission, Licenses - Procedure for Cancellation of Design.

L:45 T:0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 Aswani Kumar Bansal, 'Law of Trademarks in India', Commercial Law Publisher, 3rd edition, 2014.

2. B L Wadehra, 'Law Relating to Patents, Trademarks, Copyright, Designs and Geographical Indications', Universal Law Publishing Co, Fifth Edition, 2014.

REFERENCES

1 Krishnamurthy G.V.G, 'The Law of Trademarks, Copyright, Patents and Design'. Macmillan Publishers Limited, 2012.

2 Satyawrat Ponkse, 'The Management of Intellectual Property', Bhate & Ponkshe Publishers, 1991.

COURSE OUTCOMES

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

CO1 Identify different types of Intellectual Properties (IPs), the right of ownership, scope of protection as well as the ways to create and to extract value from IP.

CO2 Recognize the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology development

CO3 Identify activities and constitute IP infringements and the remedies available to the IP owner and describe the precautious steps to be taken to prevent infringement of proprietary rights in products and technology development

CO4 Familiar with the processes of Intellectual Property Management (IPM) and various approaches for IPM and conducting IP and IPM auditing and explain how IP can be managed as a strategic resource and suggest IPM strategy.

CO5 Apply the different procedures in IP of various IPs

16GE306	HRM AND ENTREPRENEURSHIP	L	T	P	C
	(Common to all B.E. / B. Tech. Courses)	3	0	0	3

UNIT I INTRODUCTION TO HRM AND FRAMEWORK 9

Nature of HRM, Scope of HRM, Functions and objectives, HRM: policies and Practices, Role of HRM in changing business environment.

UNIT II JOB ANALYSIS AND DESIGN & HUMAN RESOURCE PLANNING 9

Job Analysis: Introduction, Importance of Job analysis, The need for man power planning, Objectives, importance, benefits, process of HRP.

UNIT III RECRUITMENT, SELECTION AND TRAINING 9

Recruitment - Selection – Induction - Types of training methods - Purpose – benefits – resistance - Types of training methods - Purpose – Benefits - Resistance.

UNIT IV ENTREPRENEURSHIP ENVIRONMENT 9

Evaluation of the concept of Entrepreneur - Role of entrepreneurship - Knowledge and skills of entrepreneur - Need for EDP

UNIT V ENTREPRENEURSHIP DEVELOPMENT PROGRAMME 9

Criteria for selection of a product - Matching Entrepreneur with the project - Report preparation and evaluation criteria.

L : 45 T:0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 K. Aswathappa, 'Human Resource Management: Text and Cases', 7th Edition, (2013).
2. S.S. Kanka, Entrepreneurial Development, S.Chand & Company, First Edition, 1999.
3 Mamoria C.B. and Mamoria S. 'Personnel Management', 1st Edition, Himalaya Publishers.

REFERENCES

1 V S P Rao, 'Human Resource Management', 3rd Edition, Excel Books, New Delhi, (2010).
2 Dessler, 'Human Resource Management', 12th Edition, Pearson India, (2011).
3 David A. Decenzo, 'Human Resource Management', WILEY India PVT. Ltd, New Delhi.
4 David H.Holt, Asoke K. Ghosh, Porentice New Venture Creation, Sixth Edition, 2002.
5 R.K.Singal, Entrepreneurship Development and Management, Published by S.K KATARIA ,Darya Ganj, New Delhi, 2009.

COURSE OUTCOMES

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

CO1 Develop the knowledge, skills and concepts needed to resolve actual human resource management problems or issues.

CO2 Manage the employment relationship, which is a shared responsibility between employers, management, human resources specialists, and employees.

CO3 Investigate how HRM is responding to current business trends, opportunities, and challenges.

CO4 Develop the knowledge, skills and concepts of Entrepreneurship.

CO5 Evaluate the procedures and practices used for setting up an enterprise.

PROFESSIONAL ELECTIVE – IV

16EI450	ROBOTICS AND AUTOMATION	L	T	P	C
		3	0	0	3

UNIT I BASIC CONCEPTS 9

Brief history-Types of Robot Technology-Robot Anatomy-Robot classifications and specifications-Design and control issues-Degree of Freedom (DOF) of various manipulators– Programming languages-Robot Safety–End Effectors–Grippers–Need for Grippers–Types of Grippers

UNIT II ACTUATORS & SENSORS 9

Hydraulic – Pneumatic and Electric Drives – Determination of HP of Motor and Gearing Ratio – Need for Sensors – Function of Sensors – Types and Selection – Machine Vision – Ranging Sensor (Acoustic, Magnetic, Eddy Current Type) – Laser and Fibre Optic Sensor – Tactile Sensor.

UNIT III ROBOT KINEMATICS 9

Mathematical Representation of Robots – Position and Orientation – Homogenous Transformation – Representation using Denavit Hattenberg Parameters – Direct Kinematics of 2 DOF RP arm, 2 DOF PR arm, 3 DOF cylindrical arm, articulated arm, RPY wrist & SCARA arm - Inverse Kinematics – Solution Methods – Closed Form Solution – inverse kinematics of 3 DOF RRP arm.

UNIT IV ROBOT DYNAMICS 9

Lagrangian Mechanics – 2 DOF Manipulator – Lagrange Euler Formulation – Dynamic Model algorithm – Manipulator Control Problem – Linear Control Schemes – P, PI, PID & PPID Control Schemes.

UNIT V TRAJECTORY PLANNING & APPLICATIONS OF ROBOTS 9

Joint Space Trajectory Planning Techniques– Cartesian Space Trajectory Planning Techniques – Types of Robot Programming – Robotics Applications — Material Transfer, Machine loading & unloading, Palletizing, Welding, Assembly and Inspection.

L : 45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 Mittal R.K and Nagrath I.J, "Robotics and Control", 6th Reprint, Lakshmi Publications, 2007.

2 John J. Craig, "Introduction to Robotics Mechanics and Control", 3rd Edition, Pearson Education, 2009.

REFERENCES

1 Saha S.K, "Introduction to Robotics", Tata McGraw-Hill, New Delhi, 2008.

2 Ashitava Ghoshal, "Robotics-Fundamental Concepts and Analysis", 4th Edition, Oxford University Press, New Delhi, 2010.

3 Ghosh B. K, "Control in Robotics and Automation: Sensor Based Integration", 3rd Edition, Allied Publishers, Chennai, 1998.

4 S.Ghoshal, "Embedded Systems & Robotics – Projects using the 8051 Microcontroller", Cengage Learning (2009).

COURSE OUTCOMES

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

CO1 Understand the basic concept behind the working of robot

CO2 Analyze the function of actuators and sensors in robotics

CO3 Carry out design and find the position, orientation of robot from its joint angles and vice versa

CO4 Carry out design and find the manipulator location for given force and vice versa

CO5 Understand the various path planning techniques, programming and applications of Robots

16EI451	ADVANCED PROCESS CONTROL	L	T	P	C
		3	0	0	3

UNIT I MULTIVARIABLE SYSTEMS 9

Transfer Matrix Representation – State Space Representation – Poles and Zeros of MIMO System – Multivariable Frequency Response Analysis – Directions in Multivariable Systems– Singular Value Decomposition.

UNIT II MULTI LOOP REGULATORY CONTROL 9

Introduction – Process Interaction – Pairing of Inputs and Outputs – Relative Gain Array (RGA) – Properties and Application of RGA – Multi-Loop PID Controller – Biggest Log Modulus Tuning Method – Decoupling Control.

UNIT III MULTIVARIABLE REGULATORY CONTROL 9

Introduction to Multivariable Control – Multivariable IMC – Multivariable Dynamic Matrix Controller – Multivariable Model Predictive Control - Generalized Predictive Controller – Multiple Model Based Predictive Control.

UNIT IV CONTROL OF TIME VARYING AND NON LINEAR SYSTEMS 9

Models for Time – Varying and Non linear Systems – Real Time Parameter Estimation.

UNIT V BATCH AND PLANT WIDE CONTROL 9

Batch Control Systems: Control during the Batch – Run to Run Control – Batch Scheduling and Hierarchy – Plant Wide Control Issues – Steady State and Dynamic Effects of Recycle – Control and Optimization Hierarchy – Plant Wide Control Examples.

L : 45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 Dale E. Seborg, Thomas F. Edgar, Duncan A. Mellichamp, “Process Dynamics and Control”, John Wiley & Sons, 3rd Edition, 2010.

2 B. Wayne Bequette, “Process Control: Modeling, Design, and Simulation”, PHI Learning Pvt. Ltd., New Delhi, 2008

REFERENCES

1 Coughanowr D.R, „Process Systems Analysis and Control‟, 4th Edition, Tata McGraw - Hill International Edition, New Delhi, 2004

2 D. P. Eckman, „Automatic Process control‟, 7th Edition, John Wiley and Sons, NewYork, 1990.

3 Thomas E. Marlin, Marlin Thomas, “Process Control: Designing Processes and Control Systems for Dynamic Performance”, McGraw Hill Publication, 2000

4 Lennart Ljung, Ellen J. Ljung, “System Identification: Theory for the User”, Prentice Hall, 1999

5 Ray Ogunnaike, Babatunde A. Ogunnaike, W. Harmon Ray, “Process Dynamics, Modeling, and Control”, Oxford University Press, 1994

COURSE OUTCOMES

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

CO1 To develop mathematical modeling for fundamental processes

CO2 Select suitable controller for a process

CO3 Acquire knowledge about the characteristics and application of control valves

CO4 Understand the various controller tuning methods and its performance

CO5 Analyze the various multi loop controller for complex process

16EI452	NEURAL NETWORKS AND FUZZY LOGIC	L	T	P	C
		3	0	0	3

UNIT I ARCHITECTURES 9

Introduction- Biological neuron- Artificial neuron- Neuron modeling- Learning rules- Single layer feed forward network- Multi-layer feed forward network- Back propagation Algorithm-Learning factors.

UNIT II NEURAL NETWORKS FOR CONTROL 9

Introduction- Feedback networks- Discrete time hop field networks- Applications of artificial neural network- Process identification- Case Study (Neuro controller for inverted pendulum).

UNIT III FUZZY SYSTEMS 9

Introduction- Classical sets- Fuzzy sets- Fuzzy relations- Fuzzification- Defuzzification-Fuzzy rules.

UNIT IV FUZZY LOGIC CONTROL 9

Membership function- Different types of MF‟s- Knowledge base- Decision-making logic- optimizations of membership function using neural networks- Adaptive fuzzy systems.

UNIT V APPLICATION OF FLC 9

Fuzzy logic control- inverted pendulum-Image processing-Home Heating system-Blood pressure during anesthesia.

L : 45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

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

2 S.N.Sivanandam, S.N. Deepa, „Principles of Soft Computing‟, 2nd Edition, Wiley India, 2011

REFERENCES

1 S. Rajasekaran, GA VijayalakshmiPai, „Neural Networks, Fuzzy Logic and Genetic Algorithms‟, Prentice Hall of India Private Limited, 2003

2 Laurene Fausett, „Fundamentals of Neural Networks, Architectures, Algorithms and Applications‟, Prentice Hall, Englewood cliffs, 2000

3 Zimmerman H.J., „Fuzzy set theory and its Applications‟, Kluwer Academic Publishers Dordrecht, 2001.

4 Klir, G.J. Yuan Bo, „Fuzzy sets and Fuzzy Logic: Theory and Applications‟, Prentice Hall of India Pvt. Ltd., 2005.

COURSE OUTCOMES

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

CO1 Expose to the concepts of feed forward neural networks

CO2 Adequate knowledge on control schemes used in neural networks

CO3 Understanding the various types of classical sets, Fuzzy sets and its properties.

CO4 Understand about the membership function and its calculation for various systems

CO5 Analyze the various types and applications of Fuzzy Logics and Artificial Neural Networks

16EI453	DESIGN OF PROCESS CONTROL SYSTEM COMPONENTS	L	T	P	C
		3	0	0	3

UNIT I PNEUMATICS **9**

Pneumatic System Components : ISO Symbols, Pneumatic Air Supply System, Air Compressors, Pressure Regulation Devices, Directional Control Valves and Special Types of Pneumatic Valve such as Pilot-Operated Valves, Non-Return Valves, Flow Control Valves, Sequence Valves and Time Delay Valve. Process Control Pneumatics: Flapper Nozzle System, Volume Boosters, Air Relays, Pneumatic Transmitters.

UNIT II HYDRAULICS **9**

Hydraulic System Components: Hydraulic Pumps, Pressure Regulation Method, Loading Valves, Hydraulic Valves and Actuators - Speed Control Circuits for Hydraulic Actuators. Selection and Comparison of Pneumatic, Hydraulic and Electric Systems.

UNIT III TRANSMITTERS **9**

Electronic versus Pneumatic Transmitters, 2−wire, 3−wire and 4−wire Current Transmitters, Electronic Type: Temperature, Pressure, Differential Pressure, Level, Flow Transmitters and their Applications, Smart (Intelligent) Transmitters, Buoyancy Transmitters and their Applications. Converters − Pneumatic to Electrical and Electrical to Pneumatic Converters.

UNIT IV CONTROL VALVES **9**

Design of Actuators and Positioners – Types of Valve Bodies – Valve Characteristics – Materials for Body and trim – Sizing of Control Valves – Selection of Body, Materials – Characteristics of Control Valves for Typical Applications.

UNIT V TYPES OF PUMPS **9**

Pump – Performance – Characteristics of Different Pumps – Pump Operation Maintenance – Instruments used in Pumping Practice Pump Noise and Vibration – Selection of Pumps.

L : 45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 Anthony Esposite, “Fluid Power with Applications”, 6th Edition, Pearson, 1986.

2 G.Liptak, „Instrument Engineers' Handbook - Process Control”, Instrument Engineers Handbook, Volume 2, 3rd Edition, CRC Press (1995).

REFERENCES

1 J. Malley, “Practical Process Instrumentation and Control”, 4th Edition,Tata McGraw Hill, New Delhi, 2002.

2 Deo Narsingh, “System Simulation with Digital Computer”, Prentice Hall India, New Delhi, 1978

COURSE OUTCOMES

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

CO1 Design pneumatic systems

CO2 Design hydraulic systems

CO3 Design pneumatic and electronic transmitters

CO4 Design actuators and positioners for control valves

CO5 Acquire knowledge about the components of industrial motor control

PROFESSIONAL ELECTIVE – V

16EI460	INDUSTRIAL DATA NETWORKS	L	T	P	C
		3	0	0	3

UNIT I DATA NETWORK FUNDAMENTALS 9

Networks Hierarchy and Switching – Open System Interconnection Model of ISO – Data Link Control Protocol: HDLC – Media Access Protocol – Token Passing – CSMA/CD – TCP/IP.

UNIT II INTERNET WORKING 9

Bridges – Routers – Gateways – Standard ETHERNET and ARCNET Configuration Special Requirement for Networks used for Control (MAP/TOP)

UNIT III HART AND FIELDBUS 9

Introduction – Evolution of Signal Standard – HART Communication Protocol – HART Networks – HART Commands – HART Applications – Fieldbus – Introduction – General Fieldbus Architecture – Fieldbus Topology –Interoperability – Interchangeability – Introduction to OLE for Process Control (OPC).

UNIT IV MODBUS AND PROFIBUS PA/DP/FMS 9

MODBUS Protocol Structure – Function Codes – Troubleshooting Profibus – Introduction – Profibus Protocol Stack – Profibus Communication Model – Communication Objects – System Operation – Troubleshooting.

UNIT V INDUSTRIAL ETHERNET AND WIRELESS COMMUNICATION 9

Industrial Ethernet – Introduction – 10 Mbps Ethernet – 100 Mbps Ethernet – Radio and Wireless Communication – Introduction – Components of Radio Link – Radio Spectrum and Frequency Allocation – Radio MODEMs.

L : 45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 Steve Mackay, Edwin Wrijut, Deon Reynders, John Park, “Practical Industrial Data Networks Design, Installation and Troubleshooting”, Newnes Publication, Elsevier 1st Edition, 2004.

2 A. Behrouz Forouzan, “Data Communications & Networking”, 4th Edition, Tata Mc Graw hill, 2006

REFERENCES

1 Andrew S. Tanenbaum, David J. Wetherall, “Computer Networks”, Prentice Hall of India Pvt. Ltd., 5th Edition, 2011

2 Theodore S Rappaport, “Wireless Communication: Principles and Practice”, Prentice Hall of India, 2nd Edition, 2001

3 William Stallings, “Wireless Communication & Networks”, Prentice Hall of India, 2nd Edition, 2005

4 William Buchanan, “Computer Buses”, CRC Press, 2000.

5 Peterson and Davie, “Computer Networks”, 2nd Edition, Morgan Kaufmann Publishers, San Francisco, 1999.

COURSE OUTCOMES

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

CO1 Acquire the knowledge in basic networks used in data communication

CO2 Understand the basics of internetworking devices

CO3 Describe the HART and fieldbus protocol

CO4 Acquire adequate knowledge about MODBUS and profibus communication protocol

CO5 Analyze various types of transmission and ability to choose suitable cable for transmission

16EI461	INSTRUMENTATION SYSTEM DESIGN	L	T	P	C
		3	0	0	3

UNIT I DESIGN OF SIGNAL CONDITIONING CIRCUITS 9

Design of V/I Converter and I/V Converter – Analog and Digital Filter Design – Signal Conditioning Circuit for Thermocouple – Cold Junction Compensation – Thermocouple Linearization – Signal Conditioning Circuit for RTD.

UNIT II DESIGN OF TRANSMITTERS 9

RTD based Temperature Transmitter – Thermocouple based Temperature Transmitter – Design of Capacitance Based Level Transmitter – Air Purge Level Measurement – Design of Smart Flow Transmitters.

UNIT III DESIGN OF PNEUMATIC AND ELECTRONIC CONTROLLERS 9

Design of P/I and I/P Converters – Design of ON/OFF Controller – Electronic P – PI – PID Controller – Alarm and Annunciation circuits using Digital Circuits – Thyristor Power Controller.

UNIT IV ORIFICE AND CONTROL VALVE SIZING 9

Orifice Sizing – Liquid and Gas Services – Rotameter Design – Control Valve – Valve Body– Commercial Valve Bodies – Control Valve Sizing – Liquid and Gas Services – Cavitations and Flashing – Selection Criteria.

UNIT V MICROPROCESSOR BASED INSTRUMENTATION SYSTEMS 9

Introduction – Interface System Techniques – Microprocessor Based Programmable Controller Bus System – Interrupt Services and Communication Protocols – Design of Microprocessor Based System for Data Acquisition – Design of Microprocessor Based P+I+D Controller

L : 45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 C.D.Johnson , „Process Control Instrumentation Technology", 8th Edition , Prentice Hall, 2006.

2 Janardan Prasad , Jayaswal M.N , Vishnu Priye, „Instrumentation Process Control", I.K. International Publishing House Pvt. Ltd, New Delhi, 2011.

REFERENCES

1 Liptak B G, "Process Control", Chilton Book Company, Pennsylvania, 1995

2 Whitt. Michael D, "Instrumentation and Control Systems Design", ISA Publishers, 2003

3 Anderson, N.A., "Instrumentation for Process Measurements", Chilton Book Company, Pennsylvania, 1980

COURSE OUTCOMES

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

CO1 Interpret and formulate design specifications for Instrumentation Systems.

CO2 Understand the principles of operation of thermocouples and RTD

CO3 To design controllers for various applications

CO4 To compute and design the orifice plate and other instruments

CO5 Acquire knowledge on Microprocessor Based Instrumentation System

16EI462	WEB BASED INSTRUMENTATION	L	T	P	C
		3	0	0	3

UNIT I BASIC INTERNET CONCEPTS 9

History of Internet – RFCs, FYIs and STDs – Security – Protocols – Internet Addressing – DNS and Directory Services – Applications of Internet in the field of Measurement and Control – Distributed Measurements.

UNIT II INTERNET APPLICATIONS 9

Electronics Mail – Newsgroups – UUCP – FTP – Telnet – Finger – Data Acquisition using Internet – Online Monitoring and Control.

UNIT III WORLD WIDE WEB 9

Electronics Mail – Newsgroups – UUCP – FTP – Telnet – Finger – Data Acquisition using Internet – Online Monitoring and Control.

UNIT IV JAVA PROGRAMMING LANGUAGE 9

History – Language Features – Classes, Object and Methods – Sub Classing Dynamic Binding – Packages – Exceptions – Multithreading – JVM and Security – Overview of Class Library: I/O – AWT and NET – JDBC – Object Serialization – Remote Method Invocation – Java script – Java Vs C++.

UNIT V MISCELLANEOUS TOPICS 9

Intranets – Internet Commerce – Internet and VRML – Active X. Case Study: Internet based Measurement, Telemonitoring and Tele Control in Biomedical, Instrumentation Applications.

L :45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 April Marine, Susan Kirkpatrick, Vivian Neou and Carol Ward, “Internet: Getting started”, PTR Prentice Hall, 1994

2 William E. Weinman, “The CGT Book”, New Riders, 1996

REFERENCES

1 Deitel and Deitel, “Java: How to Program”, Prentice Hall, 1997.

2 Gary Cornell and Cay S. Horstmann, „Core Java (second edition)‟, Sunsoft Press, 1997

3 Ted Coombs, Jason Coombs and Don Brewer, “Active X Source book‟,JohnWiley & sons, 1996

4 Douglas E. Corner, “Computer Networks and Internet”, Prentice Hall, 1999

5 Mark Austin, David Chancogne, “Introduction to Engineering Programming in C and Java”, John Wiley & Sons, 1999

6 Raymond Greenlaw, “Fundamentals of the internet and the World Wide Web”,Tata McGraw-Hill, ND, 1999

COURSE OUTCOMES

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

CO1 Understand the principles of various protocol and to apply in various application areas

CO2 Understand the Data Acquisition using Internet in real time applications

CO3 Acquire knowledge about World Wide Web and its programming for linking various objects in the real field devices.

CO4 Acquire knowledge about the java programming language in the field of instrumentation

CO5 Understand the importance of networks in the biomedical and instrumentation applications.

16EE428	ADVANCED CONTROL SYSTEMS	L	T	P	C
		3	0	0	3

UNIT-I STATE VARIABLE ANALYSIS 9

Concept of state – State variable and state model – State models for linear and continuous time systems – Solution of state and output equation – Controllability and Observability – Pole placement – State observer design of control systems with observers

UNITII PHASE PLANE ANALYSIS 9

Features of linear and Non linear systems - Types of non-linearity, typical examples – Linearization - Concept of phase portraits – Singular points - Limit cycles – Construction of phase portraits – Phase plane analysis of linear and Non linear systems – Isocline method

UNIT III DESCRIBING FUNCTION ANALYSIS 9

Basic concepts – Describing function analysis of non linear systems – Conditions for stability – Stability of oscillations - Need for model reduction - Dominant pole concept, Model reduction via partial realization, Time moment matching and pade approximation, Hankel norm model reduction

UNIT IV STABILITY ANALYSIS 9

Introduction – Lyapunov's Stability concepts - Direct method of Lyapunov - Lure's transformation – Aizerman's and Kalman's conjecture – Popov's criterion – Circle criterion

UNIT V OPTIMAL CONTROL 9

Introduction – Decoupling – Time Varying optimal control – LQR steady state optimal control – Optimal estimation – Multivariable control design

L : 45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 MadanGopal, "Digital Control and State Variable Methods", , McGraw Hill Education (India) Private Limited; 4 edition 2012.

2 Arthur G.O.Mutambara, "Design and Analysis of Control Systems", Taylor & Francis, Reprint, 2015

REFERENCES

1 Eveleigh, V.W., "Adaptive Control and Optimisation Techniques". McGraw-Hill, 1967

2 M. Vidyasagar, "Nonlinear Systems Analysis", 2nd Ed., Prentice Hall, 1993

3 Hassan K. Khalil, "Nonlinear Systems", Third Edition, Prentice Hall, 2002

4 Nagrath I.J., and Gopal, M., "Control system Engineering" Wiley Eastern Reprint 1995.

5 Meral Altinay," Applications of Nonlinear Control**",** Prentice Hall, 2008.

COURSE OUTCOMES

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

CO1 Familiarize the state space representation of systems
CO2 Acquire knowledge about the response of non linear systems
CO3 Understand the concept of stability of control system
CO4 Understand the knowledge of methods of stability analysis
CO5 Know the techniques of optimal control

PROFESSIONAL ELECTIVE – VI

16EI470	INSTRUMENTATION AND CONTROL IN PROCESS INDUSTRIES	L	T	P	C
		3	0	0	3

UNIT I UNIT OPERATIONS 9

Basic concepts and principles of commonly used unit operations – Reactors – batch reactors – distillation towers – refrigeration units – steam boilers – furnaces – dryers – crystallizers – centrifuges – heat exchangers – pumps – compressors – evaporators – extruders.

UNIT II INSTRUMENTATION AND CONTROL IN FOOD INDUSTRY 9

Description of the process in food industry– Measurement hardware in the food industries – Analyzers in the food industry – Valves and feeders in the food industry – Controllers and displays in the food industry – Computer applications in the food industry – Typical control systems in the food industry

UNIT III INSTRUMENTATION AND CONTROL IN FERTILIZERS AND CHEMICAL INDUSTRY 9

Description of the process – Measurement hardware – analyzers – valves - Controllers and displays in fertilizers and chemical industry – Computer applications in fertilizers and chemical industry – Typical control systems in fertilizers and chemical industry

UNIT IV INSTRUMENTATION AND CONTROL IN PHARMACEUTICAL INDUSTRY 9

Description of the process – Measurement hardware in the pharmaceutical industry – Analyzers in the pharmaceutical industry – Valves and feeders in the pharmaceutical industry – Controllers and displays in the pharmaceutical industry – Computer applications in the pharmaceutical industry – Typical control systems in the pharmaceutical industry.

UNIT V INSTRUMENTATION AND CONTROL IN NUCLEAR INDUSTRY 9

Description of the process- Measurement hardware in the nuclear industry – Analyzers in the nuclear industry – Valves and control rods in the nuclear industry – Control panels and displays – Computer applications – Typical control system.

L :45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 Bela G Liptak, „Instrumentation in the Processing Industries", Chilton Book Company
2 William G. Andrew and H.B. Williams, „Applied Instrumentation in the Process Industries", 2nd edition, Gulf Professional Publishing

REFERENCES

1 Warren L. McCabe, „Unit operation of chemical engineering", 7th Edition, McGraw-Hill Education.
2 Considine. D. M, „Process/Industrial Instruments and control Handbook", 4th edition, McGraw Hill
3 M M El-Wakil, „Nuclear Power Engineering, , McGraw-Hill Book Company
4 Douglas Considine, „Process instruments and controls handbook", 5th edition, McGraw Hill
5 George Stephanopoulos, Chemical Process Control", Prentice Hall India

COURSE OUTCOMES

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

CO1 Understand the basic unit operations in process industries
CO2 Identify various instruments and control strategies in food processing industry
CO3 Provide an over view of process instrumentation in chemical industries
CO4 Acquire knowledge in control schemes in pharmaceutical industry
CO5 Identify typical control systems in nuclear industries

16EI471	COMPUTER CONTROL OF PROCESSES	L	T	P	C
		3	0	0	3

UNIT I ANALYSIS OF DISCRETE DATA SYSTEM 9

State-Space Representation of Discrete Data Systems – Selection of Sampling Process – Selection of Sampling Period – Review of Z-Transform – Pulse Transfer Function – Modified Z - Transform - Stability of Discrete Data System – Jury's Stability Test.

UNIT II DESIGN OF DIGITAL CONTROLLER 9

Digital PID – Position and Velocity Form – Deadbeat's Algorithm – Dahlin's Algorithm – Kalman's Algorithm - Pole Placement Controller – Smith Predictor Algorithm.

UNIT III INTELLIGENT CONTROL 9

Introduction to Intelligent Control: AI and Expert Control - Fuzzy Control – Neuro Fuzzy Control – Case Study: Neuro – Fuzzy Controller Based Temperature Process Control System.

UNIT IV SYSTEM MODELING 9

Mathematical Model for Processes – First Order – Second Order Processes Without and With Pure Delay Systems – Process Modeling for Step Test Data – Time Domain Identification – Linear Least Square Algorithm.

UNIT V EXPERT CONTROL 9

Expert Control System Architecture - Knowledge Representation in Expert Control - Knowledge Acquisition in Expert Control - Reasoning in Expert Control – Real-Time Expert System – Expert Systems in Computer Aided Control System Design - Anticipatory Expert Control - Case Study: An Expert Supervisory Control System.

L :45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1. Gopal, M., "Digital Control and State Variable Methods", Tata Mc Graw Hill, 2003.
2. Katalin M. Hangas, Rozalia Lakner and Miklos Gerzson, "Intelligent Control Systems – An Introduction with Examples", Kluwer Academic Publisher, 2001

REFERENCES

1. Stephanopoulos, G., "Chemical Process Control - An Introduction to Theory and Practice", Prentice Hall of India, 2005.
2 Seborg, D.E., Edgar,T.F. and Mellichamp, D.A., "Process Dynamics and Control", Wiley John and Sons, 2nd Edition, 2003.
3 E.Ikonen and K.Najim, "Advanced Process Identification and Control", Marcel Dekker,Inc. Newyork, 2002.
4 P.Albertos and S.Antonio, "Multi variable Control Systems An Engineering Approach", Springer Verlag, 2004.
5 Sigurd Skogestad,Ian Postlethwaite, "Multi variable Feedback Control: Analysis and Design", John Wiley and Sons, 2004.

COURSE OUTCOMES

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

CO1 Understand and apply computing platform and software for engineering problems.
CO2 Understand the fundamentals of various digital control algorithms and its implementation
CO3 Design Neural network, Genetic algorithm and Fuzzy Logic Controllers for various applications
CO4 Design mathematical model for various process
CO5 Gain knowledge in expert control and control system design

16EI472	PROCESS MODELING AND SIMULATION	L	T	P	C
		3	0	0	3

UNIT I INTRODUCTION **9**

Continuity Equations – Energy Equations – Equations of Motion – Transport Equations – Equations of State – Equilibrium – Chemical Kinetics.

UNIT II DISCRETE TIME SYSTEM MODEL FOR CONTROL **9**

ARX Models – ARMAX Models – NARMAX Models – Hammerstein Models – Wiener Model – Linear and Non Linear Mathematical Modeling of Dynamic System – Modeling in State Space – Canonical State Space Forms – Mechanical Systems – Electrical Systems – Liquid Level Systems – Thermal Systems – Input and Output Models – Transfer Functions.

UNIT III MODEL FOR TIME VARYING AND NON LINEAR SYSTEMS **9**

Linear Time Varying Models – Nonlinear Model as Linear Regressions – Nonlinear State Space Model – Linearization of Nonlinear Models – Single Variable – One State Variable and One Input Variable

UNIT IV BASIC SIMULATION IN MATLAB **9**

MATLAB – Numerical Solution – Runge Kutta Method – Adam Bassworth Technique – Solution of Ordinary Differential Equations – Simulation of First Order – Second Order and Lead – Lag Transfer Functions – MATLAB Routine for Step and Impulse Response.

UNIT V SIMULATION OF PROCESS MODEL **9**

Development of Dynamic Model – State Space Model and Laplace domain model of CSTR and Distillation Column using MATLAB.

L :45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1. Thomas Edgar, David Himmelblau, 'Optimization of Chemical Processing', 2nd Edition, Tata McGraw Hill (2001).
2. Dr. Shailendra Jain, 'Modeling and Simulation Using MATLAB Simulink', 5th Edition, Wiley Publisher (2011).

REFERENCES

1. B. Wayne Bequette, 'Process Dynamics Modeling, Analysis and Simulation', 4th Edition, Prentice Hall International Series in Physical and Chemical Engineering science (1998).
2. William L. Luyben, 'Process Modeling, Simulation and Control for Chemical Engineers', 2nd Edition, Tata Mc Graw Hill (1989).
3. Thomas E. Marlin, 'Process Control Designing Processes and Control Systems for Dynamic Performance', 3rd Edition, McGraw Hill International Edition, Chemical Engineering series (2000).
4. W. F. Stoecker, 'Design of Thermal Systems International Education', Tata McGraw Hill (1989).

COURSE OUTCOMES

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

CO1 Acquire knowledge of power equations
CO2 Develop discrete time system model of various systems
CO3 Develop models for non linear and time varying systems
CO4 Carry simulation using MATLAB
CO5 Develop and simulate model for chemical processes

16EC303	VLSI DESIGN	L	T	P	C
		3	0	0	3

UNIT I MOS TRANSISTOR PRINCIPLE 9

CMOS fabrication – p-well process, n-well process, twin-tub process, MOS transistor theory-IV characteristics, CV characteristics, Non-ideal IV effects, CMOS inverter –DC characteristics, Stick diagram, Layout diagrams.

UNIT II COMBINATIONAL LOGIC CIRCUITS 9

Examples of Combinational Logic Design, Pass transistor Logic, Transmission gates, Pseudo NMOS logic-static and dynamic CMOS design, Domino Logic, Power dissipation ,Low power design principles.

UNIT III SEQUENTIAL LOGIC CIRCUITS 9

Static and Dynamic Latches and Registers, Timing issues, pipelines, clock strategies, Low power memory circuits, Synchronous and Asynchronous design.

UNIT IV VLSI TESTING 9

VLSI testing -need for testing, manufacturing test principles, design strategies for test, Design for testability- BIST-chip level and system level test techniques.

UNIT V SPECIFICATION USING VERILOG HDL 9

Basic concepts- identifiers- gate primitives, gate delays, operators, timing controls, procedural assignments conditional statements, Design hierarchies, Behavioral and RTL modeling, Test benches, Examples: decoder, equality detector, comparator, priority encoder, full adder, Ripple carry adder and D flip flop.

L : 45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1 Jan Rabaey, AnanthaChandrakasan, B.Nikolic, "Digital Integrated Circuits: A Design Perspective", Second Edition, Prentice Hall of India, 2003

2. M.J. Smith, "Application Specific Integrated Circuits", Addisson Wesley, 1997

REFERENCES

1 N.Weste, K.Eshraghian, "Principles of CMOS VLSI Design", Second Edition, Addision Wesley 1993

2 R.Jacob Baker, Harry W.LI., David E.Boyee, "CMOS Circuit Design, Layout and Simulation", Prentice Hall of India 2005

3 A.Pucknell, Kamran Eshraghian, "Basic VLSI Design", Third Edition, Prentice Hall of India, 2007

4 Neil H. E. Weste and David Harris: "CMOS VLSI DESIGN", Third edition, Pearson Education, 2005.

5 Uyemura J.P: "Introduction to VLSI circuits and systems", Wiley 2002.

COURSE OUTCOMES

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

CO1 Understand the basic CMOS circuits and the CMOS process technology
CO2 Familiarize with design techniques of chip using programmable devices
CO3 Analyse the Electrical properties of MOS devices
CO4 Design combinational and sequential circuits
CO5 Elaborate arithmetic building blocks

PROFESSIONAL ELECTIVE – VII

16EI480	BIOMEDICAL INSTRUMENTATION (Common to ECE,EEE)	L	T	P	C
		3	0	0	3

UNIT I FUNDAMENTALS OF BIOMEDICAL ENGINEERING 9

Physiological System of the Human Body – Bioelectric Potential – Resting and Action Potential – Nervous System and its Fundamentals – Basic Components of a Biomedical System – Physiological Signals and Transducers - Transducers – Selection Criteria – Piezo Electric Transducer – Ultrasonic Transducers – Temperature Measurements – Fibre Optic Temperature Sensors.

UNIT II NON ELECTRICAL PARAMETERS MEASUREMENT AND DIAGNOSTIC PROCEDURES 9

Measurement of Blood Pressure - Cardiac Output - Heart Rate - Heart Sound - Pulmonary Function Measurements - Spirometer – Photo Plethysmography – Body Plethysmography – Blood Gas Analyzers – pH of Blood – Measurement of Blood pCO2 – pO2.

UNIT III BIO POTENTIAL RECORDERS 9

Electrical and Mechanical Activities of the Human Heart – Typical Electro Cardio Graph (ECG) – Electrocardiograph Bipolar and Unipolar Leads – Einthoven Triangle – Electrical Activities of the Brain – Electro Encephalo Graph (EEG)– EEG Equipment – Muscle Response – Electro Myo Graph (EMG).

UNIT IV IMAGING MODALITIES AND ANALYSIS 9

Radio Graphic and Fluoroscopic Techniques – Computer Tomography – Magnetic Resonance Imaging (MRI) – Ultrasonography – Endoscopy – Thermography – Different types of Biotelemetry Systems – Retinal Imaging – Imaging Application in Biometric Systems.

UNIT V LIFE ASSISTING AND THERAPEUTIC DEVICES 9

Pacemakers – Defibrillators – Ventilators – Nerve and Muscle Stimulators – Diathermy – Heart –Lung Machine – Audio Meters – Dialyzers – Lithotripsy – ICU Patient Monitoring System – Advanced 3D Surgical Techniques.

L :45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1. Leslie Cromwell, “Biomedical Instrumentation and Measurement”, 7th Edition, Prentice Hall (2007).
2. Khandpur R.S, “Handbook of Biomedical Instrumentation”, 2nd Edition, Tata McGraw Hill (2003).

REFERENCES

1. John G. Webster, “Medical Instrumentation Application and Design”, 4th Edition, John Wiley and Sons, New York (1998).
2. Ed. Joseph D. Bronzino, “The Biomedical Engineering Hand Book”, 3rd Edition, CRC Press (2006).
3. Joseph J.carr and John M. Brown, “Introduction to Biomedical Equipment Technology”, 4th Edition, John Wiley and Sons, NewYork (2012).
4. Suh, Sang, Gurupur, Varadraj P, Tanik, Murat M, “Health Care Systems, Technology and Techniques”, 1st Edition, Springer (2011).
5. M.Arumugam, ‘Bio-Medical Instrumentation‟, Anuradha Agencies (2003).

COURSE OUTCOMES

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

CO1 Understand the physical foundations of biological systems and the various electrodes used in medical field.
CO2 Analysis about the various electro physiological measurements in the human body.
CO3 Familiarize the working functions of bio potential recorders
CO4 Analyze the concepts of various medical imaging recorder techniques and their applications
CO5 Know about the importance of rehabilitation techniques & its applications

16EI481 INSTRUMENTATION IN PETROCHEMICAL, PAPER AND STEEL INDUSTRIES

L	T	P	C
3	0	0	3

UNIT I PETROLEUM PROCESSING 9

Petroleum Exploration – Recovery Techniques – Primary and Secondary Refining – Separation of Oil and Gas – Refining of Crude Oil - Piping and Instrumentation Diagrams

UNIT II CONTROL LOOPS IN PETROCHEMICAL INDUSTRIES 9

Process Control in Refinery and Petrochemical Industry – Control of Distillation Column – Control of Catalytic Crackers and Pyrolysis Unit.

UNIT III DESCRIPTION OF PAPER AND STEEL PROCESSING 9

PAPER: Raw Material – Basic Process – Pulping Process – Chemical Recovery Process – Paper Making.

STEEL: Process –Converting. Raw Steel Making – Basic Oxygen Furnace

UNIT IV CONTROL LOOPS IN PAPER INDUSTRIES 9

Blow Down Tank Controls – Digester Liquor Feed Pump Controls – Stock Chest Level Control – Basis Weight Control – Dryer Temperature Control – Dissolving Tank Density Control – White Liquor Flow Controls – Condensate Conductivity Control.

UNIT V CONTROL LOOPS IN STEEL INDUSTRIES 9

Blast Furnace Stove Combustion Control System – Gas and Water Controls in BOF Furnace- Sand Casting Mold Control

L :45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1. Dr. Ram Prasad, „Petroleum Refining Technology, 1st Edition, Khanna Publisher (2000).
2. B.G. Liptak, „Instrumentation in Process Industries", 1st Edition, Chilton Book Company, New York (1973).

REFERENCES

1. Liptak B G, 'PC Instrument Engineers Handbook", 2nd Edition, CRC Press (2003).
2. Howar P. Kallen, „Hand book of Instrumentation and Control", 2nd Edition, Tata McGraw-Hill (1961).
3. Considine M and Ross S D, 'Handbook of Applied Instrumentation", 3rd Edition, McGraw – Hill Professional, NewYork (2006).

COURSE OUTCOMES

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

CO1 Understand the scenario of the production and consumption of fossil fuels in India.

CO2 Know about the process control loops in Petrochemical industries.

CO3 Acquire knowledge on the various conversion processes through measuring instruments.

CO4 Understand the importance of controlling the various parameters using different kinds of equipment in industries

CO5 Know about the process control loops in steel industries

16EI482	DISTRIBUTED CONTROL SYSTEMS	L	T	P	C
		3	0	0	3

UNIT I INTRODUCTION **9**

Definition – Evolution of DCS – Generalized Architectures – Comparison of Architectures – Local Control Unit.

UNIT II DCS CONFIGURATION **9**

LCU – Configuration - Process Interfacing Issues – Communication Facilities– Operator Stations – Data Highways – Redundancy Concepts – Supervisory Computer Tasks and Configuration – System Integration with PLC and Computers

UNIT III INTERFACES IN DCS **9**

Operator Interfaces – Low Level and High Level Operator Interfaces – Engineering Interfaces – Low Level and High Level Engineering Interfaces – General Purpose Computers in DCS- HMI Standard Protocols

UNIT IV DCS DISPLAYS **9**

Standard and User Defined Displays – Continuous Process Display – Ground Display – Overview Display – Detail Display – Graphic Display – Trend Display – Loop Display – Alarm Summary Display – Annunciator Display – Batch/Sequence Display – Tuning Display- Tuning Panel Display – Instrument Faceplate

UNIT V DCS APPLICATIONS **9**

Application of DCS in iron & steel industry - Cement industry, Paper & pulp industry, Power plant, Grease manufacturing plant, Biotechnology plant, glass manufacturing and ammonia process

L :45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1. Michael P. Lukas, „Distributed Control System: Their Evaluation and design", 1st Edition, Van Nostrand Reinhold. Co, (1986).
2. Bela G.Liptak, „Process Software and digital Networks", 4th Edition,CRC Press, (2012).

REFERENCES

1. Krishna Kant, Computer based Industrial Control", Prentice Hall, New Delhi, 1997.
2. McMillan G.K, Process/Industrial Instrument Handbook", McGraw Hill, New York, 1999.
3. Curtis D Johnson, Process Control Instrumentation Technology", 8th Edition, Pearson Education, 2006
4. Gregory McMillan K, „Process/Industrial Instruments and Controls Handbook", 5th Edition, Tata Mc Graw Hill, 2009.
5. Romily Bowden, „HART application Guide and the OSI Communication Foundation", 5th Edition, Tata Mc Graw Hill, 1999

COURSE OUTCOMES

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

CO1 Understand the evolution and architecture of DCS
CO2 Acquire knowledge of DCS Configurations
CO3 Understand the various interfaces used in DCS
CO4 Acquire Knowledge of DCS Displays
CO5 Apply DCS for various industrial Applications

16EI483 MICRO ELECTRO MECHANICAL SYSTEMS

L	T	P	C
3	0	0	3

UNIT I INTRODUCTION TO MEMS 9

Introduction- emergence - devices and application- scaling issues- materials for MEMS- Thin film deposition - lithography and etching.

UNIT II ELECTRICAL AND MECHANICAL PROPERTIES OF MEMS MATERIALS 9

Conductivity of semiconductors - crystal plane and orientation - stress and stain – definition – relationship between tensile stress and stain- mechanical properties of silicon and thin films, Flexural beam bending analysis under single loading condition- Types of beam-deflection of beam-longitudinal stain under pure bending- spring constant, torsional deflection, intrinsic stress, resonance and quality factor.

UNIT III SENSING AND ACTUATION 9

Electrostatic sensing and actuation-parallel plate capacitor – Application-Inertial, pressure and tactile sensor- parallel plate actuator- comb drive. Thermal sensing and Actuations-thermal sensors-Actuators - Applications- Inertial, Flow and Infrared sensors.

UNIT IV BULK AND SURFACE MICROMACHINING 9

Anisotropic wet etching, Dry etching of silicon, Deep reactive ion etching (DRIE), Isotropic wet etching, Basic surface micromachining process- structural and sacrificial material, stiction and antistiction methods, Foundry process.

UNIT V POLYMER AND OPTICAL MEMS 9

Polymers in MEMS- polymide-SU-8 liquid crystal polymer(LCP)-PDMS-PMMA-Parylene-Flurocorbon, Application-Acceleration, pressure, flow and tactile sensors. Optical MEMS-passive MEMS optical components-lenses-mirrors-Actuation for active optical MEMS.

L :45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1. Tai Ran Tsu, „MEMS and Microsystems Design and Manufacture‟, Tata Mcgraw Hill, 2nd Edition, 2002
2. Mark Madou, „Fundamentals of Micro Fabrication‟, Taylor and Francis group, 2nd Edition,2002

REFERENCES

1. Tai Ran Hsu, „MEMS and Microsystems: Design, Manufacture and Nano Scale Engineering‟, 2nd Edition, John Wiley & Sons Publication, Hoboken, New Jersey, 2008.
2. Julian Gardener, Vijay Varadhan, Osama, „Micro sensors, MEMS and Smart devices‟, Wiley and Sons, 1st Edition, 2007.
3 Gaberiel M.Rebiz, “RF MEMS Theory, Design and Technology”, John Wiley &Sons,2003

COURSE OUTCOMES

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

CO1 Be familiar with the important concepts applicable to MEMS, their fabrication.
CO2 Be fluent with the design, analysis and testing of MEMS
CO3 Understand about the actuation and sensing techniques relating to the industry
CO4 To Familiarize with concept of various machining techniques
CO5 Apply the MEMS for different applications.

OPEN ELECTIVE

16EIOE1	BASICS OF PLC	L	T	P	C
		3	0	0	3

UNIT I PLC OVERVIEW 9

PLC – History, Architecture, Comparison with relay logic, Inputs, Outputs, PLC scan cycle, Concept of sink and source, Normally Open and Normally closed Contacts. Ladder logic programming. Logic gates implementation using Ladder Logic.

UNIT II PLC PROGRAMMING 9

Instructions in PLC - Program Control Instructions, math instructions, sequencer instructions, Basic programs using switches and coils, Concept of Latch, blinking and process repeat.

UNIT III TIMERS AND COUNTERS 9

Timer instructions, On delay timer, Off delay timer, Retentive timer, cascading timers. Counter instructions, up counter, down counter, cascading counters, Incremental encoder-counter, combining counter and timer functions. Applications: Traffic Control,Coffee vending machine, Packing application, Bottle filling application.

UNIT IV ALLEN BRADLEY PLC (RSLOGIX 5000) 9

Allen Bradley PLC – pin configuration and technical specifications, Programming Instructions. Input and Output Wiring,Installation, Selection, Trouble shooting and Maintenance.

UNIT V APPLICATIONS OF PLC 9

Material Handling, forward/reverse control of three phase induction motor, Automatic control of warehouse door, Automatic lubrication of oil supplier, Conveyor belt motor control, Automatic car washing machine, Bottle label detection

L :45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1. F.D. Petruzella, Programmable Logic Controllers, Tata Mc- Graw Hill, Third edition, 2010
2. Gary G Anderson, PLC Programming using RSLogix 500: Basic Concepts of Ladder Logic Programming: Volume 1 (PLC Programming Basics), Create Space Independent Publishing Platform

REFERENCES

1. K. L.S. Sharma, Overview of Industrial Process Automation, Elsevier, 2011 Batten G. L., Programmable Controllers", McGraw Hill Inc., Second Edition
2. PradeepKumar & Srivashtava , Programmable Logic Controller- BPB Publications
3. MdhuchhandaMitra, SamarjitSen Gupta, "Programmable Logic Controllers and Industrial Automation, An Introduction" Penram International Publishing Limited
4. Hughes .T, "Programmable Logic Controllers", ISA Press, 1989

COURSE OUTCOMES

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

CO1 Understand architecture of PLC and develop ladder logic programs for logic gates implementation.
CO2 Gain knowledge of programming concepts of PLC and develop programs for real time applications.
CO3 Understand the function of timers and counters in PLC and develop ladder logic for real time applications.
CO4 Understand the working of Allen Bradley PLC
CO5 Develop ladder logic for real time applications

16EIOE2	DATA NETWORKS	L	T	P	C
		3	0	0	3

UNIT I DATA NETWORK FUNDAMENTALS 9

Networks Hierarchy and Switching – Open System Interconnection Model of ISO – Data Link Control Protocol: HDLC– Media Access Protocol – Token Passing – CSMA/CD– TCP/IP

UNIT II INTERNET WORKING 9

Bridges – Routers – Gateways – Standard ETHERNET and ARCNET Configuration Special Requirement for Networks used for Control (MAP/TOP)

UNIT III HART AND FIELDBUS 9

Introduction – Evolution of Signal Standard – HART Communication Protocol – HART Networks – HART Commands – HART Applications – Fieldbus – Introduction – General Fieldbus Architecture– Fieldbus Topology –Interoperability – Interchangeability – Introduction to OLE for Process Control (OPC).

UNIT IV MODBUS AND PROFIBUS PA/DP/FMS 9

MODBUS Protocol Structure – Function Codes – Troubleshooting Profibus– Introduction – Profibus Protocol Stack– Profibus Communication Model– Communication Objects – System Operation – Troubleshooting.

UNIT V INDUSTRIAL ETHERNET AND WIRELESS COMMUNICATION 9

Industrial Ethernet– Introduction– 10 Mbps Ethernet– 100 Mbps Ethernet – Radio and Wireless Communication– Introduction – Components of Radio Link – Radio Spectrum and Frequency Allocation

L :45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1. Steve Mackay, Edwin Wrijut, Deon Reynders, John Park, “Practical Industrial Data Networks Design, Installation and Troubleshooting”, Newnes Publication, Elsevier 1st Edition, 2004.
2. A. Behrouz Forouzan, “Data Communications & Networking”, 4th Edition, Tata Mc Graw hill, 2006.

REFERENCES

1. Andrew S. Tanenbaum, David J. Wetherall, “Computer Networks”, Prentice Hall of India Pvt. Ltd., 5th Edition, 2011
2. Theodore S Rappaport, “Wireless Communication: Principles and Practice”, Prentice Hall of India, 2nd Edition, 2001
3. William Stallings, “Wireless Communication & Networks”, Prentice Hall of India, 2nd Edition, 2005
4. William Buchanan, “Computer Buses”, CRC Press, 2000.
5. Peterson and Davie,“Computer Networks”, 2nd Edition, Morgan Kaufmann Publishers, San Francisco, 1999

COURSE OUTCOMES

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

CO1 Acquire the knowledge in basic networks used in data communication
CO2 Understand the basics of internetworking devices
CO3 Ability to describe the HART and fieldbus protocol
CO4 Acquire adequate knowledge about MODBUS and profibus communication protocol
CO5 Analyze various types of transmission and ability to choose suitable cable for transmission

16EIOE3	BASICS OF NEURAL NETWORKS AND FUZZY LOGIC SYSTEM	L	T	P	C
		3	0	0	3

UNIT I ARCHITECTURES 9

Introduction- Biological neuron- Artificial neuron- Neuron modeling- Learning rules- Single layer feed forward network- Multi-layer feed forward network- Back propagation Algorithm- Learning factors.

UNIT II UNITII NEURAL NETWORKS FOR CONTROL 9 9

Introduction- Feedback networks- Discrete time hop field networks- Applications of artificial neural network- Process identification- Case Study (Neuro controller for inverted pendulum).

UNIT III FUZZY SYSTEMS 9

Introduction- Classical sets- Fuzzy sets- Fuzzy relations- Fuzzification- Defuzzification-Fuzzy rules.

UNIT IV FUZZY LOGIC CONTROL 9

Membership function- Different types of MF's- Knowledge base- Decision-making logic- Optimizations of membership function using neural networks- Adaptive fuzzy systems.

UNIT V APPLICATION OF FLC 9

Fuzzy logic control- inverted pendulum-Image processing-Home Heating system-Blood pressure during anesthesia.

L :45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1. J.S.R.Jang, C.T.Sun and E.Mizutani, 'Neuro - Fuzzy and Soft Computing', PHI, Pearson Education 2004.
2. S.N.Sivanandam, S.N. Deepa, 'Principles of Soft Computing', 2nd Edition, Wiley India, 2011.

REFERENCES

1. S. Rajasekaran, GA VijayalakshmiPai, 'Neural Networks, Fuzzy Logic and Genetic Algorithms', Prentice Hall of India Private Limited, 2003
2. Laurene Fausett, 'Fundamentals of Neural Networks, Architectures, Algorithms and Applications', Prentice Hall, Englewood cliffs, 2000.
3. Zimmerman H.J., 'Fuzzy set theory and its Applications', Kluwer Academic Publishers Dordrecht, 2001.
4. Klir, G.J. Yuan Bo, 'Fuzzy sets and Fuzzy Logic: Theory and Applications', Prentice Hall ofIndia Pvt. Ltd., 2005.
5. Simon Hykins, 'Neural Networks', Pearson Education.

COURSE OUTCOMES

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

CO1 Expose to the concepts of feed forward neural networks

CO2 Adequate knowledge on control schemes used in neural networks

CO3 Understanding the various types of classical sets, Fuzzy sets and its properties

CO4 Understand about the membership function and its calculation for various systems

CO5 Analyze the various types and applications of Fuzzy Logics and Artificial Neural Networks

16EIOE4	SENSORS AND TRANSDUCERS	L	T	P	C
		3	0	0	3

UNIT I INTRODUCTION **9**

Basic concepts of sensors and transducers- Difference between sensors and transducers-Need for sensor- Characteristics of transducer: Static and Dynamic - Classification of Transducer- Selection criteria.

UNIT II MECHANICAL TRANSDUCER **9**

Principle of Operation, Constructional details, characteristics and application of Bourdon tube-Diaphragm- Bellow-Strain gauge-Load cell-Accelerometers-LVDT- Gyroscope.

UNIT III ELECTRICAL TRANSDUCER **9**

Classification of electrical transducer-Resistive Transducers: Potentiometer, Anemometer- Inductive transducers: Variable reluctance transducer, EI Pick up- Capacitive transducers and its types.

UNIT IV TEMPERATURE TRANSDUCER **9**

Principle of Operation, Constructional details, characteristics and application of Thermostat-Thermistor-RTD-Thermocouple-Pyrometer.

UNIT V OTHER SENSORS **9**

Smart sensor- fiber optic sensor- Film sensor- MEMS sensor- SQUID sensor-Semiconductor IC sensor- Nano sensors.

L :45 T: 0 P: 0 Total: 45 PERIODS

TEXT BOOKS

1. D. Patranabis " Sensors and Transducers" PHI Learning Pvt. Ltd, Second edition
2. A. K. Sawhney, "A Course in Electrical and Electronic Measurements and Instrumentation", Dhanpat Rai and Sons, Eductional and Technical Publishers, Fourth Edition.

REFERENCES

1. John. S. Wilson, " Sensor Technology Handbook" , Elsevier, First edition
2. Ilene. J. Busch, " Electromechanical sensors and Actuators", Springer
3. D. V. S Murty, " Transducers and Instrumentation", PHI Learning Pvt. Ltd, Second edition
4. S. C. Mukhopadhyay, G. S. Gupta, "Smart Sensors and Sensing Technology", Springer
5. Deoblin E.O., Measurement System Application and Deisgn, McGraw Hill, 1990

COURSE OUTCOMES

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

CO1 Analyze the characteristics and performance of transducers

CO2 Understand the fundamental principles of various types of mechanical transducer

CO3 Analyze the operation of electrical transducers

CO4 Describe the operation of temperature transducer

CO5 Illustrate the advanced types of transducers

ONE CREDIT COURSE

16EIOC1 **ARDUINO** **15**

Introduction to embedded systems- Microprocessors and microcontrollers – Arduino Introduction Arduino IDE - Introduction to Embedded C programming: Variables – Functions - Loops - Conditions - Theory & Hands on Session –Interfacing: LED, Switch, LCD, Keypad LCD - Theory & Hands on Session - Interfacing: UART Transmission - UART Reception - ADC peripheral - Temperature sensor Interfacing. Theory & Hands on Session – Interfacing: PWM generation - DC motor interfacing With PWM signals – DC motor Interfacing with normal GPIO outputs. Wireless Modules Interfacing: Zigbee – GSM. IoT with Arduino: Introduction to IoT - Applications and Advantages Hands on Session : Controlling of devices from web server, Controlling of devices from Android , Interfacing with cloud and controlling various devices from cloud

Total: 15 PERIODS

TEXT BOOKS

1. Getting Started with Arduino" by Massimo Banzi, O′Reilly; 2nd edition, 2011
2. Beginning Arduino Programming (Technology in Action), Apress; 1st edition,2011

COURSE OUTCOMES

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

CO1 Understand the basic framework for developing Arduino code

CO2 learn how to program your Arduino interface board to sense the physical world

Introduction to Embedded Systems –Developer Suit Overview: How to setup Rasperry Pi, OS installation and Configuration – Python :Introduction to Python, Programming in Python, Linux command Sets – Python programming Hands on, Rasperry Pi overview : Features, Market Trends and Application – ARM Architecture Model

Total: 15 PERIODS

TEXT BOOKS

1. Ernest Woodruff, "Raspberry Pi: The Complete User Guide for Beginners and Experts with Tips & Tricks On How to Setup Raspberry Pi and build Innovative Projects", 2016
2. Simon Monk, "Programming the Raspberry Pi, Third Edition: Getting Started with Python", McGraw Hill; 3rd edition, 2012

COURSE OUTCOMES

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

CO1 Learn the Features and Specifications of Raspberry Pi

CO2 Understand the Raspberry Pi Functionalities

Industrial Automation – Field Instruments: Introduction, Relays Contactors, OLR,MCB,MCCB,MPCB, Proximity Sensors, Color Sensor, switches and Push buttons, Alert Alarm, Hooters, Level Transmitters, Temperature Controller and RTD, pressure Transmitter, Flow Transmitter, Grounding of Field Instruments Industrial Safety: Introduction, Safety Protection of Motors, Grounding Methods, Wires Selection, Shielding wires, Instruments handling and Installation, Selection of Protective Devices, Safety precautions of device Installment

Total: 15 PERIODS

TEXT BOOKS

1. "Industrial safety management", L M Deshmukh, TATA McGraw Hill, 2010

COURSE OUTCOMES

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

CO1 Learn good instruments maintenance practices

CO2 Understand Safety, Protection and Control engineering concepts

Introduction to Robotics , Co-ordinate system and their application, Introduction to Motosim Software and basic position movement for six axis and using various interpolation, Robot Motoman introduction and basic movements using various interpolation, Basic Program development using manipulator, Motosim Program development on interpolation types and programming on 2D and programming for 3D Models, Multi robot work station programming using Motosim, Programming using various interpolation joint , linear, circular and spline using manipulator, application development in manipulator motoman.

Total: 15 PERIODS

TEXT BOOKS

1. Industrial Robotics -Technology ,Programming and Applications (SIE), 2nd Edition, 2015

COURSE OUTCOMES

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

CO1 Learn the fundamentals of robotics and industrial applications of robots

CO2 Learn the latest trends in the field of Industrial Robotics

Introduction To Piping Responsibilities Of Piping Engineer And Designer Process Flow Diagram Utility Flow Diagram P&I Diagram Objectives Piping & Instrumentation Diagram P&I Diagram Symbols Interpreting P&I Diagram – Valves Interpreting P&I Diagram – Equipment Interpreting P&I Diagram – Control & Safety Systems Industry Codes And Standard Government Regulations Engineering Fluid Diagrams Electrical Diagrams Electronic Diagrams Logic Diagrams Application of P&I Diagrams In HAZOPS And Risk Analysis

Total: 15 PERIODS

TEXT BOOKS

1. Piping and Instrumentation Diagram Development, Wiley-AIChE; 1st edition,2015
2. Frederick A Meier, Clifford A Meier, "Instrumentation and Control Systems Documentation", Instrument Society of America, 2004

COURSE OUTCOMES

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

CO1 Understand the basic development rules of piping and instrumentation diagram

CO2 Learn the elements for the design, operation, and maintenance of process industries

Introduction – Application- Introduction – Communication details – hardware configuration – wiring details – programming concepts – instructions – address allocation for RTU's – Networking – Controlling of field instruments – programming application

Total: 15 PERIODS

TEXT BOOKS

1. Moustafa Elshafei, "Modern Distributed Control Systems: A comprehensive coverage of DCS technologies and standards", 2016

COURSE OUTCOMES

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

CO1 Understand the advancement of the technologies involved in the modern Distributed Control Systems

CO2 Able to learn the important issues in the design, implementation, and operation of DCS systems