E.G.S. PILLAY ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai

Accredited by NAAC with ' A' Grade | Accredited by NBA (CSE, EEE, MECH)

NAGAPATTINAM – 611 002

B.E ELECTRONICS AND COMMUNICATION ENGINEERING

First Year – First Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1901MA104	Engineering Mathematics –I (Linear Algebra, Calculus and Partial differentiation)	3	1	0	4	40	60	100
1901CH102	Chemistry for Electronic Engineers	3	0	0	3	40	60	100
1901GEX03	Programming for Problem Solving	3	0	0	3	40	60	100
1901ENX01	English for Engineers	2	0	0	2	100	-	100
Laboratory Course								
1901GEX52	Computer Programming Lab	0	0	2	1	50	50	100
1901GEX51	Engineering Intelligence I	0	0	2	1	50	50	100
1901CHX51	Engineering Chemistry Lab	0	0	2	1	50	50	100
1901HS151	Communication Skills	0	0	2	1	100	0	100
Total		**11**	**1**	**8**	**16**	**470**	**330**	**800**

L – Lecture | T – Tutorial | P – Practical | CA – Continuous Assessment | ES – End Semester

1901MA104	MATHEMATICS –I (LINEAR ALGEBRA, CALCULUS AND PARTIAL DIFFERENTIATION)	L	T	P	C
		3	1	0	4

(Common for ECE, MECH & BME Programme)

MODULE I MATRICES **9 Hours**

Inverse and rank of a matrix - rank-nullity theorem - System of linear equations – Symmetric-skew-symmetric and orthogonal matrices – Determinants - Eigen values and Eigen vectors-Diagonalization of matrices-Cayley-Hamilton Theorem - Orthogonal transformation.

MODULE II DIFFERENTIAL CALCULUS **9 Hours**

Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature- Evaluates and involutes.

MODULE III INTEGRAL CALCULUS **9 Hours**

Double integration – Cartesian and polar coordinates – Change the order of Integration – Applications: Area of a curved surface using double integral – Triple integration in Cartesian co-ordinates – Volume as triple integral.

MODULE IV SEQUENCES AND SERIES **9 Hours**

Convergence of sequence and series-Tests for convergence - Power series - Taylor's series, Series for exponential - trigonometric and logarithm functions.

MODULE V PARTIAL DIFFERENTIATION **9 Hours**

Partial derivatives, total derivative; Maxima, minima and saddle points; Method of Lagrange multipliers.

TOTAL: 45 HOURS

REFERENCES:

1. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2018.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010

1901CH102 **CHEMISTRY FOR ELECTRONIC ENGINEERS** **L T P C**
(Common for ECE & EEE Programme) **3 0 0 3**

Employability | Entrepreneurship

MODULE I **9 Hours**

Electrochemistry- Cell Terminology-Electrochemical cells- Electrolytic cells- Cell reactions- Daniel cell- Difference between electrolytic cells and electrochemical cells. Reversible cells and irreversible cells -types- EMF and its applications - Nernst equation (derivation and problems). Single electrode potential - Hydrogen electrode - Calomel electrode - Glass electrode - pH measurement using glass electrode.

MODULE II **9 Hours**

Semiconductors- Conductors, insulators, semiconductors, – Band theory semiconductors – Junction devices – Super conductivity – Ionic conductivity – defects in stoichiometric and Non stoichiometric crystals. Optical properties of solids – Lasers and phosphors – Photovoltaic effect- Solar energy storage and conversion materials.

MODULE III **9 Hours**

Materials for communications - crystalline semiconductors; metalized film conductors; dielectric films; solders; ceramics and polymers. Electronic materials, Semiconductor crystals - Silicon, III–V compounds, Photoresist films, Packaging materials, Photonic materials, Crystalline materials - Epitaxial layers, Optical switching, Optical transmission-NLO and OLED Materials.

MODULE IV **9 Hours**

Biosensors- biosensors -types of biosensors- magnetic biosensors, thermal biosensors- piezoelectric biosensors- optical biosensors - applications of biosensor. introduction: classification of polymers – natural and synthetic; thermoplastic and thermosetting. conducting polymers, electron conducting polymers- polyaniline (pan), polypyrroles (ppy), polythiophenes (pt) and polyphenylene vinylenes (ppv) - light emitting diodes , photo-induced doping.

MODULE V **9 Hours**

Nanotechnology - Basics - distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Nanoparticles: nano cluster, nano rod, nanotube (CNT) and nanowire. Synthesis: precipitation, thermolysis, hydrothermal, solvothermal, electrodeposition, chemical vapour deposition, laser ablation; Properties and applications.

TOTAL: 45 HOURS

REFERENCES:

1. Dara S.S, Umare S.S, "Engineering Chemistry", S. Chand & Company Ltd., New Delhi 2010.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company, Ltd., New delhi 2010
3. Gowariker V.R., Viswanathan N.V. and Jayadev Sreedhar, "Polymer Science", New Age .
4. Ozin G. A. and Arsenault A. C., "Nanochemistry: A Chemical Approach to Nanomaterials", RSC Publishing, 2005
5. Biosensors: An Introductory Textbook by C. S. Pundir and Jagriti Narang,2017
6. J.O.M.Bockris & A.K.N.Reddy, "Modern Electrochemistry –Vol. I & II" , Plenum Press, New York, 2000
7. Peter Atkins and Julio de Paula, "Physical Chemistry", VII Edition, Oxford University Press, New York, 2002.
8. A.J. Bard and L.R. Faulkner, "Electrochemical Methods – Fundamentals and applications" 3 rd edition John Wiley & Sons Inc, 2001.

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

	PROGRAMMING FOR PROBLEM SOLVING	L	T	P	C
1901GEX03	(Common for all B.E./B.Tech Programme)	3	0	3	4

Entrepreneurship

MODULE I INTODUCTION TO PROGRAMMING **9 Hours**

Components of Computers and its Classifications- Problem Solving Techniques – Algorithm- Flowchart–Pseudo code – Program-Compilation -Execution

MODULE II BASICS OF C PROGRAMMING **9 Hours**

Structure of C program - C programming: Data Types – Storage classes - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions - Input/output statements – Decision making statements - Switch statement - Looping statements – Pre-processor directives.

MODULE III ARRAYS AND STRINGS **9 Hours**

Introduction to Arrays: Declaration, Initialization – One dimensional array – Two dimensional arrays – Example Program: Matrix Operations - String operations

MODULE IV FUNCTIONS AND POINTERS **9 Hours**

Introduction to functions: Function prototype, function definition, function call, Built-in functions – Recursion – Example Program – Pointers – Pointer operators – Pointer arithmetic – Arrays and pointers – Array of pointers – Example Program: Sorting of names – Parameter passing: Pass by value, Pass by reference – Example Program: Swapping of two numbers and changing the value of a variable using pass by reference

MODULE V STRUCTURES & FILE PROCESSING **9 Hours**

Structure - Nested structures – Pointer and Structures – Array of structures – Example Program using structures and pointers – Dynamic memory allocation -Files – Types - File processing: Sequential access, Random access - Command line arguments

TOTAL: 45 HOURS

REFERENCES:

1. Paul Deitel and Harvey Deitel, —C How to Program‖, Seventh edition, Pearson Publication
2. Juneja, B. L and Anita Seth, —Programming in C‖, CENGAGE Learning India pvt. Ltd., 2011
3. Pradip Dey, Manas Ghosh, —Fundamentals of Computing and Programming in C‖, First Edition, Oxford University Press, 2009.
4. Anita Goel and Ajay Mittal, —Computer Fundamentals and Programming in C‖, Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
5. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C",McGraw-Hill Education, 1996.

Dr. S. RAMABALAN, M.E., Ph.D.
PRINCIPAL
E.G.S. Pillay Engineering College,
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Nagapattinam (Dt) Tamil Nadu.

1901ENX01 **ENGLISH FOR ENGINEERS** **L T P C**

(Common for all B.E./B.Tech. Programme) **3 0 0 3**

Skill Development

MODULE I FOCUS ON LANGUAGE (Vocabulary and Grammar) **9 Hours**

Vocabulary -The Concept of Word Formation - prefixes- suffixes- Synonyms – Antonyms - Grammar -Articles- Preposition- Adjective-Adverb-connectives -Tenses (present, past & future) - Sentence pattern- types of sentences -Active voice –passive voice and Impersonal passive voice - Wh- Questions.

MODULE II LISTENING SKILLS **9 Hours**

Listening- listening intently-arousing and sustaining interest-listening to short or longer texts- formal and informal conversations- telephonic etiquettes- narratives from different sources. -listening and Note taking- correlative verbal and nonverbal communication-listening to TOEFL & IELTS programs-listening to Project presentation- listening to technical seminar and conferences.

MODULE III SPEAKING SKILLS **9 Hours**

Speaking - stress and intonation –persuasive speaking -Describing person, place and thing - sharing personal information — greetings –taking leave -Individual and Group Presentation-impromptu Presentation-public speaking-Group Discussion- project planning-facing viva voce and delivering project.

MODULE IV READING SKILLS **9 Hours**

Reading– comprehending general and technical articles -cloze reading - inductive reading- short narrative and descriptions from newspapers – Skimming and scanning-reading and interpretation-critical reading interpreting and transferring graphical information- sequencing of sentences-analytical reading on various Projects.

MODULE V WRITING SKILLS **9 Hours**

Writing- Precise writing –Summarizing- interpreting visual texts (pie chart, bar chart, picture - advertisements etc., - Proposal writing (launching new units or department in a institution or industry & to get loan from bank) -report writing (accident, progress, project, survey, Industrial visit)- job application- e-mail drafting- letter writing (permission, accepting and decaling)-instructions – recommendations –checklist

TOTAL: 45 HOURS

REFERENCES:

1. Raman, Meenakshi and Sangeetha Sharma, "Technical Communication: Principles and Practice", Oxford University Press, New Delhi, 2011.
2. Rizvi and Ashraf M., "Effective Technical Communication", Tata McGraw-Hill, New Delhi, 2005.
3. G. Radhakrishna Pillai, "English for Success", Central Institute of English and Foreign Languages", Emerald Publishers ,Hyderabad, 2003
4. Jones, D, "The Pronunciation of English", CUP, . Cambridge,2002.

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
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Nagapattinam (Dt) Tamil Nadu.

1901GNX51	ENGINEERING INTELLIGENCE I (Common for all B.E./B.Tech. Programme)	L	T	P	C
		0	0	2	1

MODULE I BEHAVIORAL CHANGES – TRANSITION OF SCHOOL TO COLLEGE **6 Hours**

Vocabulary -The Concept of Word Formation - prefixes- suffixes- Synonyms – Antonyms - Grammar - Articles-Preposition- Adjective-Adverb-connectives -Tenses (present, past & future) - Sentence pattern-types of sentences -Active voice –passive voice and Impersonal passive voice - Wh- Questions.

MODULE II EXPOSURE TO INDIVIDUAL COMPETANCE **6 Hours**

Listening- listening intently-arousing and sustaining interest-listening to short or longer texts- formal and informal conversations- telephonic etiquettes- narratives from different sources. -listening and Note taking- correlative verbal and nonverbal communication-listening to TOEFL & IELTS programs-listening to Project presentation- listening to technical seminar and conferences.

MODULE III CAREER PLANNING **6 Hours**

Speaking - stress and intonation –persuasive speaking -Describing person, place and thing - sharing personal information — greetings –taking leave -Individual and Group Presentation-impromptu Presentation-public speaking-Group Discussion- project planning-facing viva voce and delivering project.

MODULE IV INTRODUCTION TO COMMUNICATION SKILLS **6 Hours**

Reading– comprehending general and technical articles -cloze reading - inductive reading- short narrative and descriptions from newspapers – Skimming and scanning-reading and interpretation-critical reading interpreting and transferring graphical information- sequencing of sentences-analytical reading on various Projects.

MODULE V COMMUNICATION EXERCISE-1 **6 Hours**

Writing- Precise writing –Summarizing- interpreting visual texts (pie chart, bar chart, picture - advertisements etc., - Proposal writing (launching new units or department in a institution or industry & to get loan from bank) -report writing (accident, progress, project, survey, Industrial visit)- job application-e-mail drafting- letter writing (permission, accepting and decaling)-instructions – **recommendations –checklist**

TOTAL: 30 HOURS

REFERENCES:

1. Dr.P.Prasad(2012) "The Functional Aspects of COMMUNICATION SKILLS";fifth Edition;S.K Kataria &Sons Publication
2. Kalyana; (2015) "Soft Skill for Managers"; First Edition; Wiley Publishing Ltd.
3. Aruna Koneru (2008) "Professional Communication"; Second edition; Tata McGraw-Hill Publishing Ltd.

1901HS151

COMMUNICATION SKILLSLAB (Common for all B.E./B.Tech. Programme)	**L**	**T**	**P**	**C**
	0	**0**	**2**	**1**

List of Experiments:

1. **Activities on Fundamentals of Inter-personal Communication**

Starting a conversation - responding appropriately and relevantly - using the right body language - Role Play in different situations & Discourse Skills- using visuals.

2. **Activities on Reading Comprehension**

General Vs Local comprehension, reading for facts, guessing meanings from context, Scanning, skimming, and inferring meaning, critical reading & effective googling.

3. **Activities on Writing Skills**

Structure and presentation of different types of writing - letter writing/ Resume writing/e-correspondence/ Proposal writing/Technical report writing/ Portfolio writing - planning for writing - improving one's writing.

4. **Activities on Presentation Skills**

Oral presentations (individual and group) through JAM sessions / seminars / PPTs and written presentations through posters/ projects/ reports/ e-mails/ assignments etc.- creative and critical thinking.

5. **Activities on Soft Skills**

Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation-Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conferencing and Mock Interviews-Timemanagement-stress management –paralinguistic features- Multiple intelligences – emotionalintelligence – spiritual quotient (ethics) – intercultural communication – creative and critical.

Total: 45 Hours

References:

1. Raman, Meenakshi and Sangeetha Sharma, "Technical Communication: Principles and Practice", Oxford University Press, New Delhi, 2011.
2. Sudha Rani, D , "Advanced Communication Skills Laboratory Manual" , Pearson Education 2011.
3. Paul V. Anderson ,"Technical Communication",. Cengage Learning pvt. Ltd. New Delhi, 2007.
4. "English Vocabulary in Use series", Cambridge University Press 2008.
5. "Management Shapers Series" ,Universities Press (India) Pvt Ltd., Himayatnagar, Hyderabad 2008.
6. Rizvi and Ashraf M., "Effective Technical Communication", Tata McGrawHill, New Delhi, 2005.
7. Jones, D, "The Pronunciation of English", CUP, . Cambridge,2002.

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NAGAPATTINAM – 611 002

B.E ELECTRONICS AND COMMUNICATION ENGINEERING

First Year – Second Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1901MA204	Engineering Mathematics –II (Calculus, Ordinary Differential Equations and Complex Variable)	3	2	0	4	40	60	100
1901PH202	Semiconductor Physics and Optoelectronics	3	0	0	3	40	60	100
1901GEX01	Basic Electrical and Electronics Engineering	3	0	0	3	40	60	100
1901GEX02	Engineering Graphics	2	2	0	3	50	50	100
1901GE201	Engineering Exploration	2	0	0	2	40	60	100
Laboratory Course								
1901GE254	Computer Hardware and IT Essentials Lab	0	0	2	1	50	50	100
1901GE252	Engineering Intelligence - II	0	0	2	1	100	0	100
1901GEX51	CAD Lab	0	0	2	1	50	50	100
1901GEX53	Basic Electrical and Electronics Engineering Lab	0	0	2	1	50	50	100
1901PHX51	Engineering Physics Lab	0	0	2	1	50	50	100

L – Lecture | T – Tutorial | P – Practical | CA – Continuous Assessment | ES – End Semester

1901CHX51

ENGINEERING CHEMISTRY LAB
(Common for all B.E./B.Tech. Programme)

L	T	P	C
0	0	2	1

List of Experiments:

1. Determination of total, temporary & permanent hardness of water by EDTA method
2. Determination of strength of given hydrochloric acid using pH meter
3. Estimation of iron content of the given solution using potentiometer
4. Estimation of sodium present in water using flame photometer
5. Corrosion experiment – weight loss method
6. Determination of molecular weight of a polymer by viscometer method
7. Conductometric titration of strong acid Vs strong Base
8. Estimation of dissolved oxygen in a water sample/sewage by Winkler's method.
9. Comparison of alkalinities of the given water samples
10. Determination of concentration of unknown colored solution using spectrophotometer
11. Determination of percentage of copper in alloy
12. Determination of ferrous iron in cement by spectrophotometry method
13. Adsorption of acetic acid on charcoal
14. Determination the flash point and fire point of a given oil using pen skyMartine closed cup apparatus
15. Determination the calorific value of solid fuels
16. Determination the structural of the compound using chemo software.

Total: 45 Hours

References:

1. Furniss B.S. Hannaford A.J, Smith P.W.G and Tatchel A.R., "Vogel"s Textbook of practical organic chemistry", LBS Singapore (1994).
2. Jeffery G.H., Bassett J., Mendham J.and Denny vogel"s R.C, "Text book of quantitative analysis chemical analysis", ELBS 5th Edn. Longman, Singapore publishers, Singapore, 1996.
3. Daniel R. Palleros, "Experimental organic chemistry" John Wiley & Sons, Inc., New Yor (2001).
4. Kolthoff I.M., Sandell E.B. et al. "Quantitative chemical analysis", Mcmillan, Madras 1980.

1901MA204	ENGINEERING MATHEMATICS – II (Calculus, Ordinary Differential Equations and Complex Variable)	L	T	P	C
		3	2	0	4

MODULE I LAPLACE TRANSFORM Skill Development Entrepreneurship **12 Hours**

Laplace Transform – Conditions for existence – Transform of Elementary Functions – Basic Properties – Transform of Unit step function and Impulse function – Transform of Periodic function – Inverse Laplace Transform – Convolution Theorem (excluding Proof) – Initial and Final value Theorems – Solution of Linear ODE of Second order with constant coefficient using Laplace Transform techniques.

MODULE II VECTOR CALCULUS **12 Hours**

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) – Applications of the above theorems to find surface area of a closed region and volume of cube and parallel piped.

MODULE III ORDINARY DIFFERENTIAL EQUATIONS **12Hours**

Second order linear differential equations with variable coefficients, method of variation of parameters.

MODULE IV COMPLEX VARIABLE – DIFFERENTIATION **12Hours**

Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; Conformal mappings, Mobius transformations.

MODULE V COMPLEX VARIABLE– INTEGRATION **12 Hours**

Contour integrals, Cauchy Integral formula (without proof), Taylor"s series, zeros of analytic functions, singularities, Laurent"s series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.

TOTAL: 60 HOURS

REFERENCES:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edn., Wiley India, 2009.
4. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
5. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., McGraw Hill, 2004.
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

Dr. S. RAMABALAN, M.E., Ph.D.,
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1901PH202 SEMICONDUCTOR PHYSICS AND OPTOELECTRONICS

L	T	P	C
3	0	0	3

MODULE I ELECTRONIC MATERIALS **9 Hours**

Free electron theory, Density of states and energy band diagrams, Energy bands in solids, E-k diagram, Direct and indirect bandgaps, Types of electronic materials: metals, semiconductors and insulators, Occupation probability, Fermi level.

MODULE II SEMICONDUCTORS **9 Hours**

Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier- concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction, Metal- semiconductor junction (Ohmic and Schottky).

MODULE III SEMICONDUCTOR LASERS **9 Hours**

Optical transitions in bulk semiconductors: absorption, spontaneous emission, and stimulated emission; Density of states for photons, Transition rates (Fermi's golden rule), Optical loss and gain. Semiconductor laser (GaAs): materials, device characteristics, figures of merit and Vertical-Cavity Surface-Emitting Lasers (VECSEL), Tunable semiconductor lasers.

MODULE IV SEMICONDUCTOR PHOTODETECTORS **9 Hours**

Types of semiconductor photodetectors -p-n junction, PIN, and Avalanche and their structure, working principle, and characteristics, Noise limits on performance; Solar cells.

MODULE V NANO- OPTOELECTRONIC DEVICES **9 Hours**

Digital systems: Boolean algebra - Reduction of Boolean expressions - De-Morgan"s theorem - Logic gates - Implementation of Boolean expressions.

TOTAL: 45 HOURS

REFERENCES:

1. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc. (1995).
2. B. E. A. Saleh and M. C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc., (2007).
3. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley (2008).
4. A. Yariv and P. Yeh, Photonics: Optical Electronics in Modern Communications, Oxford University Press, New York (2007).
5. P. Bhattacharya, Semiconductor Optoelectronic Devices, Prentice Hall of India (1997).
6. Online course: "Semiconductor Optoelectronics" by M R Shenoy on NPTEL
7. Online course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak Gupta on NPTEL

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PRINCIPAL
E.G.S. Pillay Engineering College,
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1901GEX01 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

L	T	P	C
3	0	0	3

MODULE I INTRODUCTION TO DC AND AC CIRCUITS **7 Hours**

Introduction to DC and AC circuits: Ohms law - Kirchhoff's laws - Mesh analysis - Nodal analysis - Generation of AC waveforms - Analysis of R-L, R-C, R-L-C circuits - Introduction to three phase systems - Types of connections.

MODULEII ELECTRICAL MACHINES **6 Hours**

Electrical Machines: DC Generator, DC Motor, Transformer, Induction Motor: Working principle, construction and applications.

MODULEIII MEASURING INSTRUMENTS Entrepreneurship **6 Hours**

Measuring instruments: Classification of instruments; Voltmeter, Ammeter, Wattmeter, Energy meter, Multimeter, CRO: Principles and operation.

MODULEIV SEMICONDUCTOR DEVICES Entrepreneurship **7 Hours**

Semiconductor devices: V-I characteristics of PN junction diode and Zener diode; Rectifiers - Half wave and full wave rectifiers; BJT - configurations; Amplifiers & Oscillators: classification, operation and applications; SCR: Construction and V-I characteristics; Basic power converters (Block diagram approach only).

MODULEV DIGITAL SYSTEMS **6 Hours**

Digital systems: Boolean algebra - Reduction of Boolean expressions - De-Morgan's theorem - Logic gates - Implementation of Boolean expressions.

MODULEVI COMMUNICATION SYSTEMS **6 Hours**

Communication Systems: Model of communication system - Analog and digital, Wired and wireless channel - Block diagram of various communication systems - Microwave, satellite, optical fiber and cellular mobile system.

MODULEVII ELECTRICAL SAFETY AND WIRING **7 Hours**

Electrical safety and wiring: Safety measures in electrical system - Safety devices - types of wiring - Wiring accessories- staircase, fluorescent lamps and corridor wiring - Basic principles of earthing - Types of earthing - layout of generation, transmission and distribution of power (Single line diagram).

TOTAL: 45 HOURS

REFERENCES:

1. Smarajit Ghosh, "Fundamentals of Electrical and Electronics Engineering", 2nd Edition, PHI Learning, 2010.
2. R. Muthusubramaniam, S. Salaivahanan and K.A. Mureleedharan, "Basic Electrical Electronics and Computer Engineering",Tata McGraw Hill, 2004.
3. D.P. Kothari and I.J. Nagrath, "Theory and Problems of Basic Electrical Engineering", PHI learning, New Delhi, 2004
4. J.B. Gupta, "Fundamentals of Electrical Engineering and Electronics", S.K. Kataria and Sons, Reprint 2012 Edition.
5. R.L. Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", Pearson, 11th Edition, 2013.
6. George Kennedy and Bernard Davis, "Kennedy's Electronic communication Systems", McGraw Hill Education, 5th Edition, 2011.
7. Donald P. Leach, Albert Paul Malvino and Goutam Saha, "Digital Principles and Applications", McGraw-Hill Education, 8th Edition, 2014.

Dr. S. RAMABALAN, M.E., Ph.D.,
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1901GEX02	ENGINEERING GRAPHICS	L	T	P	C
		2	2	0	3

MODULE I CONCEPTS AND CONVENTIONS (Not for Examination) **5 Hours**

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

MODULEII PLANE CURVES AND FREE HAND SKETCHING **9 Hours**

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three-Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of Objects.

MODULEIII PROJECTION OF POINTS, LINES AND PLANE SURFACES **9 Hours**

Orthographic projection- principles-Principal Planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

MODULEIV PROJECTION OF SOLIDS **9 Hours**

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method.

MODULE V PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES **9 Hours**

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

MODULE VI ISOMETRIC AND PERSPECTIVE PROJECTIONS **9 Hours**

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.

TOTAL: 45+5 HOURS

REFERENCES:

1. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore,2016.
2. Luzzader, Warren.J. and Duff,John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
3. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson, 2nd Edition, 2015.
4. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2017.
5. Natrajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2015.
6. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
7. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50th Edition, 2016.

1901GE201	ENGINEERING EXPLORATION	L	T	P	C
		2	0	0	2

What is Engineering: Engineering Requirement, Knowledge within Engineering disciplines, Engineering advancements

Engineering Design: Problem definition, idea generation through brainstorming and researching, solution creation through evaluating and communicating, text/analysis, final solution and design improvement.

Defining problems and Brainstorming: Researching design, sketching problem solving.

Communicating solution: Dimensioning orthographic drawing, perspective drawing.

Modeling and Testing final output: Product evaluation, reverse engineering, final project report.

Civil Engineering: Structural forces structural analysis, bridge design components, structural design.

Mechanical Engineering: Types of motion, mechanical power system, mechanical power formula, mechanical design.

Electrical Engineering: Reading analog multimeter, measuring current, voltage and resistance, electricity from chemicals, solar cells, magnets, Ohms law and watts law, circuit identification and circuit calculation, resistor color code, continuity.

Computer Engineering: Logic gates, algorithms, computer architecture, binary code.

TOTAL: 30 HOURS

REFERENCES:

1. Ryan A.Brown, Joshua W.Brown and Michael Berkihiser: "Engineering Fundamentals: Design, Principles, and Careers", Goodheart-Willcox Publisher, Second Edition, 2014.
2. Saeed Moaveni ,"Engineering Fundamentals: An Introduction to Engineering", Cengage learning, Fourth Edition, 2011.

1901GE254	COMPUTER HARDWARE AND IT ESSENTIALS LAB	L	T	P	C
		0	0	2	1

List of Experiments:

1. Study of hardware components (such as storage devices, I/O devices, CPU, Motherboard, other peripherals).
2. Installation of operating systems (Windows and Linux).
3. Other software installation.
4. Study of network components.
5. Network establishment(configuring IP address, Domain name system)
6. Study of Internet.
7. Introduction to Web.
8. Usage of internet services- Email, File Sharing, Social Media etc.
9. Study of firewalls and Antivirus.
10. Troubleshooting various problems.

Skill Development

TOTAL: 30 HOURS

REFERENCES:

1. Craig Zacker& John Rourke, "The complete reference:PC hardware", Tata McGrawHill, New Delhi, 2001.
2. Mike Meyers, "Introduction to PC Hardware and Troubleshooting", Tata McGrawHill, New Delhi, 2003.
3. B.Govindarajulu, "IBM PC and Clones hardware trouble shooting and maintenance",
4. Tata McGraw-Hill, New Delhi, 2002
5. R. Kelly Rainer , Casey G. Cegielski , Brad Prince, Introduction to Information Systems, Fifth Edition, Wiley Publication, 2014.
6. James F. Kurose, —Computer networking: A Top-Down Approachl, Sixth Edition, Pearson, 2012.
7. R. Kelly Rainer , Casey G. Cegielski , Brad Prince, Introduction to Information Systems, Fifth Edition, Wiley Publication, 2014
8. Craig Zacker& John Rourke, "The complete reference:PC hardware", Tata McGrawHill, New Delhi, 2001.

Dr. S. RAMABALAN, M.E., Ph.D.
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

1901GE252	ENGINEERING INTELLIGENCE II	L	T	P	C
		0	0	2	1

Skill Development

MODULE I VOCABULARY BULIDING **6 Hours**

Parts of Grammar- SVA- Art of Writing- word building activities

MODULEII COMMUNICATION WORKSHOP **6 Hours**

Story Telling- Newspaper Reading-Extempore.

MODULEIII INTERPERSONAL SKILLS **6 Hours**

Personality Development - Creativity and innovation –Critical Thinking and Problem Solving – Work Ethics-Technical Skill Vs Interpersonal Skills

MODULEIV LEADERSHIP& EMPLOYABILITY SKILLS **6 Hours**

Levels of Leadership-Making of leader-Types of leadership-Transactions Vs Transformational Leadership – Exercises - Industry Expectations & Career Opportunities- Recruitment patterns.

MODULE V RESUME BUILDING **6 Hours**

Importance of Resume- Resume Preparation - introducing onself

TOTAL: 30 HOURS

REFERENCES:

1. Barun K. Mitra; (2011), "Personality Development & Soft Skills", First Edition; Oxfor Publishers.
2. Raymond Murphy, Essential English Grammar in Use, Cambridge University press, New Delhi, Third Edition , 2007.
3. Arun Sharma and Meenakshi Upadhyav, How to Prepare for Verbal Ability and Reading Comprehension for CAT, McGrawHill Publication, Seventh Edition 2017.

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

1901GEX51	CAD (COMPUTER AIDED DRAFTING) LAB	L	T	P	C
		0	0	2	1

List of Experiments:

Basics commands of a CAD software- two-dimensional drawing, editing, layering and dimensioning - coordinate Systems-Drawing practice - orthographic views of simple solids using CAD software.

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

TOTAL: 30 HOURS

References:

1. N.D. Bhatt, Machine Drawing, Charotar Publishing House Pvt. Ltd., 2014.
2. P.S. Gill, A Textbook of Machine Drawing, Katson books, 2013.
3. R.K. Dhawan, A Textbook of Machine Drawing, S. Chand,2012.
4. K.C. John, Textbook of Machine Drawing, PHI Learning Pvt. Ltd.,2009.

1901GEX53	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY	L	T	P	C
		0	0	2	1

List of Experiments:

1. Experiments related to verification of Ohm"s law and Kirchhoff"s laws
2. Experiments involving logic gates
3. Fan and light control using regulators
4. Design of 6V regulated power supply
5. Energy conservation demonstration experiment using energy meter
6. Waveform generation and calculation of RMS and average values
7. IC 555 and IC 741 based experiments
8. Experiments in earthing
9. Staircase wiring and residential building wiring
10. Speed control of DC shunt motor

Total: 30 Hours

References:

1. Edward Hughes, " Electrical Technology,", Pearson Education
2. D.P. Kothari and Nagrath" Basic Electronics",MH Education 2013.
3. Paul Scherz and Simon Monk "Practical Electronics for inventors" Mc Graw Hill Publications 2013.

1901PHX51	ENGINEERING PHYSICS LAB	L	T	P	C
		0	0	2	1

List of Experiments:

1. Determination of wavelength of various colours of mercury spectrum using Laser grating
2. Determination of velocity of liquids using ultrasonic interferometer
3. Determine the dispersive power of a prism using spectrometer
4. Determine the unknown resistance of the given wire using Carey-Foster"s Bridge
5. Determine the band gap of the given semiconductor
6. Determine the acceptance angle and particle size using Laser
7. Torsional pendulum – Rigidity modulus of a steel wire
8. Thickness of a thin wire – Air Wedge
9. Measurement of Young"s modulus – Uniform and Non-uniform bending
10. Thermal conductivity –Lee"s Disc method

Total: 45 Hours

References:

1. „Practical Physics", R.K. Shukla, Anchal Srivastava, New age international (2011)
2. „B.Sc. Practical Physics", C.L Arora, S. Chand &Co. (2012)

E.G.S. PILLAY ENGINEERING COLLEGE(Autonomous)

Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai |

Accredited by NAAC with „A"Grade |Accredited by NBA (CIVIL, CSE, ECE, EEE, IT, MECH)

NAGAPATTINAM – 611 002

B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

FullTimeCurriculum And Syllabus

Second Year – Third Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1901MA301	Engineering Mathematics III (Linear Algebra and Vector Calculus)	3	1	0	4	40	60	100
1902EC301	Electronic Devices	3	0	0	3	40	60	100
1902EC302	Circuits and Networks	2	1	0	3	40	60	100
1902EC303	Digital Electronics	2	1	0	3	40	60	100
1901EC304	Biology for Engineers	3	0	0	3	40	60	100
1902CS306	Object Oriented Programming and Data Structures	3	0	0	3	40	60	100
Laboratory Course								
1902EC351	Devices and Circuits Laboratory	0	0	2	1	50	50	100
1902EC352	Digital Electronics Laboratory	0	0	2	1	50	50	100
1902CS354	Object Oriented Programming and Data Structures Laboratory	0	0	2	1	50	50	100
1904GE351	Life Skills: Verbal Ability	0	0	2	1	100	0	100
	Total	**18**	**3**	**6**	**23**	**590**	**510**	**1100**
Audit Course								
1901MCX02	Constitution of India	2	0	0	0	0	-	0

L–Lecture|T–Tutorial|P–Practical|C–Credit|CA –ContinuousAssessment| ES–EndSemester

1901MA301 **ENGINEERING MATHEMATICS III (LINEAR ALGEBRA AND VECTOR CALCULUS)**

L	T	P	C
3	1	0	4

MODULE I VECTOR SPACES **12 Hours**

Vector spaces – Subspaces – Linear combinations and system of Linear equations – Linear independence and Linear dependence – Bases and Dimensions

MODULE II LINEAR TRANSFORMATIONS Entrepreneurship **12 Hours**

Linear combination system of linear equation – algebra of transformation – Linear transformation of matrices – Linear functional – transpose of linear transformation

MODULE III FOURIER SERIES **12 Hours**

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

MODULE IV FOURIER TRANSFORMS Entrepreneurship **12 Hours**

Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval"s identity

MODULEV Z – TRANSFORMS AND DIFFERENCE EQUATIONS Employability **12 Hours**

Z - transforms – Elementary properties – Inverse Z – transform (using partial fraction and residues) – Convolution theorem – Formation of difference equations – Solution of difference equations using Z – transform.

REFERENCES: **TOTAL: 60 HOURS**

1. Friedberg, A.H., Insel, A.J. and Spence, L., —Linear Algebral, Prentice - Hall of India, New Delhi, 2004.
2. Veerarajan. T., "Transforms and Partial Differential Equations", Second reprint, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2012
3. Kumaresan, S., —Linear Algebra – A geometric approachl, Prentice – Hall of India, New Delhi, Reprint, 2010.
4. Grewal. B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, Delhi, 2012.
5. Bali.N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 7th Edition, Laxmi Publications Pvt Ltd , 2007
6. Ramana.B.V., "Higher Engineering Mathematics", Tata Mc-GrawHill Publishing Company Limited, New Delhi, 2008.
7. Narayanan.S.,ManicavachagomPillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students" Vol. II & III, S.Viswanathan Publishers Pvt Ltd. 1998.
8. www.nptelvideos.in/2012/11/mathematics-iii.html

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

1902EC301 **ELECTRON DEVICES**

L	T	P	C
3	0	0	3

MODULE I SEMICONDUCTOR DIODE **9 Hours**

PN junction diode, Current equations, Diffusion and drift current densities, forward and reverse bias characteristics, Switching Characteristics.

MODULE II BIPOLAR JUNCTION TRANSISTOR **9 Hours**

NPN - PNP – Junctions - Early effect - Current equations – Input and Output characteristics of CE, CB, CC - Hybrid - π model - h-parameter model, Ebers Moll Model- Gummel Poon-model, Multi Emitter transistor.

MODULE III FIELD EFFECT TRANSISTORS **9 Hours**

JFETs – Drain and Transfer characteristics - Current equations - Pinch off voltage and its significance – MOSFET - Characteristics - Threshold voltage - Channel length modulation, D-MOSFET, E-MOSFET- Current equation - Equivalent circuit model and its parameters, FINFET, DUAL GATE MOSFET.

MODULE IV SPECIAL SEMICONDUCTOR DEVICES, **9 Hours**

Metal-Semiconductor Junction- MESFET, Schottky barrier diode - Zener diode - Varactor diode Tunnel diode- Gallium Arsenide device, LASER diode, LDR.

POWER DEVICES AND DISPLAY DEVICES

UJT, SCR, Diac, Triac, Power BJT, LED, Photo diode, Photo transistor, Opto Coupler, Solar cell, LCD,CCD.

MODULE V RECTIFIERS & POWER SUPPLIES **9 Hours**

Full-wave: Centre tapped and bridge rectifiers with resistive load -Analysis for V_{dc} and ripple voltage with C, C-L, L-C and C-L-C filters. Clippers and clampers.Zener diode regulator –Transistor voltage regulators: Series and shunt regulators - Switched mode power supply

Total: **45 Hours**

TEXT BOOKS:

1. Salivahanan .S and Sureshkumar .N, —Electronic Devices & Circuits‖, 3rd Edition, Tata McGraw- Hill, New Delhi, 2011, ISBN : 9781259006418

References:

1.Jacob Millman, Christos C. Halkias—Electronic Devices and Circuits‖, 3rdEdition, McGraw Hill Education (India) Private Limited, 2010, ISBN :9780070700215

2.Allen Mottershead, —Electronic Devices and Circuits-An Introduction‖, 1stEdition, PHI, New Delhi, 1990, ISBN : 9788120301245.

3.Electronic Devices and Circuits Theory, Boylsted, Prentice Hall Publications.

4. https://www.youtube.com/watch?v=oqOG6XErAI8

5. https://www.youtube.com/watch?v=Kp-jS6NHsB8&list=PLF178600D851B098F

Dr. S. RAMABALAN, M.E., Ph.D.
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

1902EC302 **CIRCUITS AND NETWORKS**

L	T	P	C
2	1	0	3

MODULE I BASIC ELECTRIC CIRCUITS **9+3=12 Hours**

Basic of electric circuits, Ohms law- Thevenintheorem-Norton theorem-Maximum power transfer theorem- KCL and KVL, Nodal analysis and Mesh analysis with dependant and independent Current & Voltage Sources, Analysis of ladder and lattice networks - Tuned circuits

MODULE II RLC CIRCUITS **9+3=12 Hours**

Voltage current relationship of Capacitor- Inductor- Resistor, First order RL,RC circuits- Laplace transformation-S domain-Source free and step response of RL-RC-Tank Circuit, Second order RLC- Source free and step response of RLC serial & parallel

MODULE III AC POWER ANALYSIS Entrepreneurship **9+3=12Hours**

Sinusoidal waves- Phasor-Impedance and Admittance in AC-Phasor based circuit analysis-Power and Energy calculation, Self-inductance – Mutual Inductance- Ideal transformers, Frequency response and resonance

MODULE IV TWO PORT NETWORK Entrepreneurship **9+3=12 Hours**

Network functions - Poles and Zeros of network functions - Complex frequency - Two port parameters Z,Y,H and ABCD - Scaling network functions - Interrelationships between the parameters-T and π equivalent circuits- Bridged networks-Coupled circuits as two port network

MODULE V NETWORKS AND GRAPHS Entrepreneurship **9+3=12Hours**

Loop Impedance and Node Admittance Matrices, Duality in Electrical Networks, Network graph-Tie set-Cut set-Duality

Total: **45+15 =60 Hours**

References:

1. David A Bell "Electric Circuits, (7thEdition, 2011)". Oxford press.
2. Franklin F.Kuo, "Network Analysis and Synthesis (5th Edition ,2012)" Wiley International;2010
3. A.V.Bakshi, U.A.Bakshi "Circuit Theory" (First edition, 2009), Technical Publications
4. A Nagoorkani "Circuit theory" (Third Edition 2016) Mcgraw hill education
5. S. Salivahanan, N.Suresh Kumar, Electronic devices and ciruits (Second edition, 2011), Mcgraw hill Education
6. M.E.VanValkenberg, "Introduction to Modern Network Synthesis", Wiley Eastern.

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu

1902EC303 **DIGITAL ELECTRONICS**

L	T	P	C
2	1	0	3

MODULE I BOOLEAN ALGEBRAANDLOGICGATES **(6+2) 8 Hours**

Boolean Algebra: Booleanexpression – MinimizationofBoolean expressions–Minterm–Maxterm-Sum of Products (SOP)–ProductofSums (POS)– Karnaugh map Minimization(2,3,4,5 Variables) –Quine- McCluskeymethod ofminimization.

MODULE II COMBINATIONAL LOGICS **(9+3) 12 Hours**

Introduction – Designprocedure– Adders &subtractor (Halfadder, Full Adder,Half subtractor, Full subtractor FastAdders, SerialAdder/Subtractor,BCDadder)–BinaryMultiplier/ Divider-Multiplexer/Demultiplexer–decoder/ encoder–paritygenerators/checker–codeconverters -MagnitudeComparator

MODULE III SEQUENTIAL LOGICS **(12+4) 16 Hours**

Latches,Flipflops, SR,JK,D,T,Edgetriggering,LevelTriggering-Design of Synchronouscounters,SynchronousUp/Downcounters,Programmablecounters, Modulo–ncounter-Registers,Universalshift registers-AsynchronousRippleorserial counter,AsynchronousUp/Downcounter –StateMachines–ProblemsinAsynchronousCircuits

MODULE IV PROGRAMMABLE LOGIC DEVICES **(9+3) 12Hours**

Classificationofmemories(RAM,ROM,PROM,EPROM,EEPROM)-ProgrammableLogicDevices (PLA,PAL,FPGA)-Implementationof combinational logiccircuitsusing ROM,PLA, PAL

MODULE V 8085 MICROPROCESSOR **(9+3) 12 Hours**

Evolution Of Microprocessors - 8-Bit Processor - 8085 Architecture, Register Organization, Instruction Sets, Timing Diagram, Addressing Modes, Interrupts, Interrupt Service Routines- Assembly Language Programming Using 8085.

Total: **(45+15) 60 Hours**

References:

1. Ronald J. Tocci, Neal S. Widmer & Gregory L. Moss, "Digital Systems: Principles and Applications", 10th Edition, Pearson Prentice Hall, 2007
2. M.MorrisMano,"DigitalDesign",4th Edition,PrenticeHallofIndiaPvt.Ltd.,2008/Pearson Education (Singapore)Pvt.Ltd., NewDelhi,2003
3. Ramesh Gaonkar "Microprocessor Architecture, Programming, and Applications with the 8085"- 5th edition Penram International Publishing-2000.
4. John F.Wakerly, "DigitalDesign",FourthEdition,Pearson/PHI,2008
5. John.MYarbrough, "Digital Logic Applications andDesign",ThomsonLearning, 2006

E-References

1. https://www.coursera.org/learn/digital-systems (Digital Systems: From Logic Gates to Processors from barcelona autonomous university)
2. Electronics-Digital Circuit Design-Udemy
3. https://nptel.ac.in/courses/117106086/ (Digital Circuits and Systems by IITM)

1901EC304 **BIOLOGY FOR ENGINEERS**

L	T	P	C
3	0	0	3

MODULE I Life (Introduction to cells) **8 Hours**

Biomolecules: Carbohydrates, Proteins, Nucleic Acids, Lipids, Enzymes. Cell structure and composition; The central dogma in molecular biology; Darwinian evolution; Molecular perspective and classification; Phylogenetic trees; Study of inter-and intra-species relationships; Microorganisms and Infectious Diseases

MODULE II Life Processes (Functioning of Human Systems) **7 Hours**

Muscular System; Nervous System; Special Senses; Sensory organs (eye, ear, smell, taste, touch); Cardiovascular System; Respiratory System; Renal System; Immune System; Endocrine System; Cancer and Life style diseases; Stem cells

MODULE III Biochips **10 Hours**

Biochips -Introduction to Biochips, Its features, types and components. Advantages and Disadvantages, Applications of Biochips.Human-organs-on-chips; Applications; Challenges; Future scopes

MODULE IV Bioelectronics **10 Hours**

Overview of bioelectronics – Electron Transfer through proteins – Electrochemical DNA Sensors – Interfacing Biological molecules with Group IV Semiconductors for Bioelectronics sensing – DNA Templated Electronics – Neuron semiconductor Interface - Medical applications of bioelectronics: ECG, EEG, etc.

MODULE V Bio-Sensors **10 Hours**

Introduction – Basic Principle of Biosensor – Components of Biosensor: Bioreceptors : Enzyme bioreceptors, Antibody bioreceptors, Nucleic acid bioreceptors, Aptasensors, Microbial biosensors – Classification of biosensors based on transducers – Piezoelectric biosensors – Non-invasive biosensors – Electrochemical Biosensors – Biosensor electrode fabrication technique – Biomedical Applications

Total: **45 Hours**

Further Reading:

Bio medical Instrumentation

References:

1. Biology for Engineers, Rajiv Singal , CBS Publishers and Distributors Pvt Ltd; First Edition edition (4 June 2019).
2. Biology for Engineers, Wiley Editorial, Wiley (2018).
3. Biosensors: An Introductory Textbook, Jagriti Narang, C.S. Pundir, Jenny Stanford Publishing; 1 edition (11 April 2017)
4. Biochips: Technology and Applications, Wan-Li Xing , Jing Cheng, Springer; 2003 edition (11 July 2003)
5. Biosensors and Bioelectronics, Chandran Karunakaran Kalpana Bhargava Robson Benjamin, Elsevier publications book series

1902CS306 **OBJECT ORIENTED PROGRAMMING AND DATA STRUCTURES**

L	T	P	C
3	0	0	3

MODULE I OBJECT ORIENTED PROGRAMMING **9Hours**

Evolution of Programming methodologies- Introduction to OOP -Basic Concepts - Structure of C++ Program- Compiling and Executing C++ Program - Data types - Operators - Expressions - Control statements &Iteration statements in C++ - Arrays-Structures-Pointers

MODULE II FUNCTIONS& CONSTRUCTORS **9Hours**

Functions - Passing Data to Functions - Scope and Visibility of variables in Functions - Dynamic Binding - data members - member functions - this Pointer - Friend Functions - Friend Classes - Constructors and Destructors.

MODULE III LINEAR DATA STRUCTURES **9 Hours**

Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation — singly linked lists –Polynomial Manipulation - Stack ADT – Queue ADT - Evaluating arithmetic expressions

MODULE IV NON-LINEAR DATA STRUCTURES **9 Hours**

Trees – Binary Tree-Binary search trees -Tree traversal -Expression manipulation -Symbol table construction - AVL trees: Rotation, Insertion, Deletion,–Red black tree – Graph and its representations – Graph Traversals – Representation of Graphs – Breadth-first search – Depth-first search - Connected components.

MODULE V SORTING AND SEARCHING **9 Hours**

Sorting Techniques-Selection, Bubble, Insertion, Merge, Heap, Quick, and Radix sort -Address calculation - Linear search -Binary search -Hash table methods.

Total: **45 Hours**

References:

1. Deitel and Deitel, "C++, How To Program", Seventh Edition, Pearson Education, 2013.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Fourth Edition, Addison-Wesley, 2013.
3. Bhushan Trivedi, "Programming with ANSI C++, A Step-By-Step approach", Oxford University Press, 2010.
4. Goodrich, Michael T., Roberto Tamassia, David Mount, "Data Structures and Algorithms in C++", 7th Edition, Wiley. 2016.
5. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, Mc Graw Hill, 2009.
6. Bjarne Stroustrup, "The C++ Programming Language", 3rd Edition, Pearson Education, 2007.
7. Ellis Horowitz, Sartaj Sahni and Dinesh Mehta, "Fundamentals of Data Structures in C++", Galgotia Publications, 2007.

1902EC351	DEVICES AND CIRCUITS LABORATORY	L	T	P	C
		0	0	2	1

Skill Development / Entrepreneurship / Employability

List of Experiments:

1. Characteristics of PN Junction Diode and Zener diode
2. Characteristic of Rectifiers, clippers and clampers
3. Characteristics of BJT (common emitter configuration) and determination of h parameters
4. Characteristics of JFET and MOSFET
5. Characteristics of SCR and UJT
6. Characteristics of TRIAC
7. Verification of Ohm„s Law and Kirchoff„s Laws.
8. Verification of Thevenin„s and Norton„s Theorem.
9. Verification of Superposition Theorem, Maximum Power Transfer Theorem
10. Simulation of Transient Response of RL and RC circuits using PSPICE

Mini Project

- Design of Power supply.
- Design of Regulators using zener diode.

Total: 45 Hours

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

1902EC352 **DIGITAL ELECTRONICS LABORATORY**

L	T	P	C
0	0	2	1

List of Experiments:

1. Study and Verification of Boolean Theorems using basic gates
2. Design, Simulate andimplementationof4 bit codeconvertersusinglogicgates
3. Design, Simulate andimplementationof4 bit binary Adder/ Subtractorand BCD adder
4. Design, Simulate andimplementationof 4:1Multiplexerand De-multiplexerusinglogicgates
5. Design, Simulateand implementationof4 to 2 encoderand decoderusinglogicgates
6. Design, Simulateand implementationof 4 bit parity generator and checker
7. Design, Simulate and implementation of 2 bit Magnitude Comparator
8. Constructionand verificationof4 bit synchronousup/down counterandMod-9/Mod-14Ripple counters(Both simulation and implementation)
9. Simulation and ImplementationofSISO, SIPO, PISO andPIPO shift registersusing Flip- flops
10. Simulation of 4 bit multiplier and Random number generator using HDL

Additional Experiments: **Total: 45 Hours**

1. Design and Implementation of seven segment display using basic logic gates
2. Simulation of 4 bit parallel divider and state machine problems

References:

1. Ronald J. Tocci, Neal S. Widmer & Gregory L. Moss, "Digital Systems: Principles and Applications", 10th Edition, Pearson Prentice Hall, 2007
2. M.MorrisMano,"DigitalDesign",4th Edition,PrenticeHallofIndiaPvt.Ltd.,2008/Pearson Education (Singapore)Pvt.Ltd., NewDelhi,2003
3. Joseph Cavanagh, "Verilog HDL: Digital Design and Modeling", Taylor & Francis, 2007
4. John F.Wakerly, "DigitalDesign",FourthEdition,Pearson/PHI,2008
5. John.MYarbrough, "Digital Logic Applications andDesign",ThomsonLearning, 2006

1902CS354 **OBJECT ORIENTED PROGRAMMING AND DATA STRUCTURES LABORATORY**

L	T	P	C
0	0	4	2

List of Experiments:

1. Basic Programs for C++ Concepts
2. Array implementation of List Abstract Data Type (ADT)
3. Linked list implementation of List ADT
4. Cursor implementation of List ADT
5. Stack ADT - Array and linked list implementations
6. Implementation of Stack ADT (by using files (i) and implementing file (iii))
7. Implement another Stack Application using array and linked list implementations of Stack ADT (by implementing files (iv) and using file (ii), and then by using files (iii) and (iv)
8. Queue ADT – Array and linked list implementations
9. Search Tree ADT - Binary Search Tree
10. Implement an interesting application as separate source files and using any of the searchable ADT files developed earlier. Replace the ADT file alone with other appropriate ADT files. Compare the performance.

Additional Experiments:

1. Hash table implementation
2. Graph traversals

Total: 45 Hours

References:

1. F.RichardGilberg, A.Behrouz. Forouzan, Data Structures, A Pseudocode Approach with C. Thomson, 2007.
2. M. A. Weiss, Data Structures and Algorithm Analysis in C, Pearson Education, 2009.
3. Y.Langsam, M. J.Augenstein and A. M.Tenenbaum, Data Structures using C, Pearson Education,2004.
4. A. M.AhoHopcroft and J.D. Ullman, Data Structures and Algorithms, Pearson education, 2000.

1904GE351 **LIFE SKILLS: VERBAL ABILITY**

L	T	P	C
2	0	0	1

Skill Development

MODULE I VOCABULARY USAGE **6 Hours**

Introduction - Synonyms and Antonyms based on Technical terms – Single word Substitution – Newspaper, Audio and video listening activity.

MODULE II COMPREHENSION ABILITY **6 Hours**

Skimming and Scanning – Social Science passages – Business and Economics passages – latest political and current event based passages – Theme detection – Deriving conclusion from passages

MODULE III BASIC GRAMMAR AND ERROR DETECTION **6 Hours**

Parallelism – Redundancy – Ambiguity – Concord - Common Errors – Spotting Errors – Sentence improvement – Error Detection FAQ in Competitive exams.

MODULE IV REARRANGEMENT AND GENERAL USAGE **6 Hours**

Jumble Sentences – Cloze Test - Idioms and Phrases – Active and passive voice – Spelling test.

MODULE V APPLICATION OF VERBAL ABILITY **6 Hours**

Business Writing - Business Vocabulary - Delivering Good / Bad News - Media Communication - Email Etiquette – Report Writing - Proposal writing – Essay writing– Indexing –Market surveying.

Total: **30 Hours**

References:

1. Arun Sharma and Meenakshi Upadhyav, How to Prepare for Verbal Ability and Reading Comprehension for CAT, McGrawHill Publication, Seventh Edition 2017
2. R S Aggarwal and Vikas Aggarwal , Quick Learning Objective General English ,S.Chand Publishing House, 2017
3. Dr.K.Alex , Soft Skills, S.Chand Publishing House, Third Revise Edition, 2014
4. Raymond Murphy, Essential English Grammar in Use, Cambridge University press, New Delhi, Third Edition , 2007

1901MCX02 **CONSTITUTION OF INDIA**

L	T	P	C
1	0	0	0

MODULE I INTRODUCTION **6 Hours**

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

MODULE II STRUCTURE AND FUNCTION OF CENTRAL GOVERNMENT **6 Hours**

Union Government - Structures of the Union Government and Functions - President- Vice President- Prime Minister - Cabinet - Parliament - Supreme Court of India - Judiciary view.

MODULE III STRUCTURE AND FUNCTION OF STATE GOVERNMENT **6 Hours**

State Government-Structure and Functions - Governor - Chief minister-Cabinet-State Legislature- Judicial System in States -High Courts and other sub ordinate Courts.

MODULE IV CONSTITUTION FUNCTIONS **6 Hours**

Indian Federal System -Center -State Relations- Constitutional Amendments - Constitutional Functionaries - Assessment of working of Parliamentary System in India.

MODULE V INDIAN SOCIETY **6 Hours**

Society: Nature, Meaning and definition; India Political Structure; Caste, Religion, Languages in India;Constitutional Remedies for citizens-Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections

Total: **30 Hours**

References:

1. Durga Das Baslli 'Introduction to the Constitution of India " Prentice Hall of India, New Delhi.
2. R.C.Agarwal, (1997) 'Indian Political System', S.Chand and Company, New Delhi.
3. Maciver and Page, • Society: An Introduction Analysis " Mac Milan India Ltd., New Delhi.
4. K.L.Sharma, (1997) 'Social Stratification in India: Issues and Themes', Jawaharlal NehruUniversity, New Delhi.

Approved in IV Academic Council Meeting Held on25.05.2019

E.G.S. PILLAY ENGINEERING COLLEGE(Autonomous)

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NAGAPATTINAM – 611 002

B.E ELECTRONICS AND COMMUNICATION ENGINEERING

Full Time Curriculum And Syllabus

Second Year – Fourth Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1901MA402	Probability Theory and StochasticProcesses	3	0	0	3	40	60	100
1902EC401	Electronics Circuits	3	0	0	3	40	60	100
1902EC402	Signals and Systems	2	1	0	3	40	60	100
1902EC403	Electromagnetic Fields	3	0	0	3	40	60	100
1902EC404	Analog Integrated Circuits	3	0	0	3	40	60	100
1902EC405	Microprocessors and Microcontrollers	3	0	0	3	40	60	100
Laboratory Course								
1902EC451	Electronics and Integrated Circuits Laboratory	0	0	2	1	50	50	100
1902EC452	Microprocessors and Microcontrollers Laboratory	0	0	2	1	50	50	100
1904GE451	Life Skills: Reasoning	2	0	0	1	100	-	100
	Total	**19**	**1**	**4**	**21**	**540**	**460**	**1000**
Audit Course								
1901MCX01	Environmental Science	0	0	0	0	100	-	100

L–Lecture|T–Tutorial|P–Practical|C–Credit|CA –ContinuousAssessment| ES–EndSemester

		Total:	**45 Hours**
Further Reading:			
	Modern control systems.		
Course Outcomes:			
	After completion of the course, Student will be able to		
	1. Students are enabled to use new words in their day to day communication.		
	2. Students are capable to gather information swiftly while reading passages		
	3. Students are proficient during their oral and written communication.		
	4. Students are equipped to rearrange the sentences and able to identify the voice of the sentence		
	5. Students use their knowledge of the best practices to craft effective business documents		
References:			
1. Arun Sharma and Meenakshi Upadhyav, How to Prepare for Verbal Ability and Reading Comprehension for CAT, McGrawHill Publication, Seventh Edition 2017			
2. R S Aggarwal and Vikas Aggarwal , Quick Learning Objective General English ,S.Chand Publishing House, 2017			
3. Dr.K.Alex , Soft Skills, S.Chand Publishing House, Third Revise Edition, 2014			
4. Raymond Murphy, Essential English Grammar in Use, Cambridge University press, New Delhi, Third Edition , 2007			

Skill Development

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

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NAGAPATTINAM–611002

B.E. Electronics and Communication Engineering

Full Time Curriculum and Syllabus

Third Year– Fifth Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1702EC501	Analog Communication	3	0	0	3	40	60	100
1702EC502	Antenna and Wave Propagation	3	0	0	3	40	60	100
1702EC503	Digital Signal Processing	3	2	0	4	40	60	100
1702EC504	Computer Networks	3	0	0	3	40	60	100
	Professional Elective – I	3	0	0	3	40	60	100
	Professional Elective – II	3	0	0	3	40	60	100
Laboratory Course								
1702EC551	Analog Communication Laboratory	0	0	4	2	50	50	100
1702EC552	Digital Signal Processing Laboratory	0	0	4	2	50	50	100
	Technical Seminar	0	0	2	1	100	-	100
	Life Skills: Aptitude – I	0	0	2	1	100	-	100
	Total	**18**	**2**	**12**	**25**	**540**	**460**	**1000**
Professional Elective – I								
1703EC501	Nano Electronics	3	0	0	3	40	60	100
1703EC502	Automotive Electronics	3	0	0	3	40	60	100
1703EC503	Micro Electronics	3	0	0	3	40	60	100
1703EC504	Biomedical Engineering	3	0	0	3	40	60	100

1703EC505	Robotic Vision	3	0	0	3	40	60	100
Professional Elective – II								
1703EC506	Computer Architecture and Organization	3	0	0	3	40	60	100
1703EC507	Advanced Microcontrollers	3	0	0	3	40	60	100
1703EC508	Measurement and Instrumentation	3	0	0	3	40	60	100
1703EC509	Virtual Instrumentation	3	0	0	3	40	60	100
1702CSX01	Operating Systems	3	0	0	3	40	60	100

L–Lecture|T–Tutorial|P–Practical|C–Credit|CA –ContinuousAssessment| ES–EndSemester

1702EC501	ANALOG COMMUNICATION	L	T	P	C
		3	0	0	3

Course Objectives:

1. To provide an introduction on different analog modulation and demodulation systems.
2. To study various types of noise and analyze the noise performance of various receiver.
3. To learn Pulse analog modulation and demodulation techniques.

Unit I **AMPLITUDE MODULATION SYSTEMS** **9 Hours**

Need for modulation – Classifications of modulation techniques-Generation and detection: AM, DSBSC, SSB-SC, VSB-Comparison of Amplitude modulation systems- AM transmitters-AM receivers-Super heterodyne receiver.

Unit II **ANGLE MODULATION SYSTEMS** **9 Hours**

Frequency modulation: Narrowband and wideband FM- Phase Modulation- Generation of FM signal: Direct FM, indirect FM- Demodulation of FM signals -FM stereo multiplexing- FM transmitters- FM receivers-Receiver parameter.

Unit III **RANDOM PROCESS** **9 Hours**

Random variables-Random process-Auto correlation process-Power spectral density-Stationary process-Wiener–Khinchin theorem, Transmission of random process through LTI system, WSS ergodic process-Gaussian Process.

Unit IV **NOISE IN COMMUNICATION SYSTEM** **9 Hours**

Noise calculation-Noise figure-Noise temperature-Noise equivalent bandwidth-Narrowband noise-Noise in AM receiver,Noise in DSBSC receiver-Noise in SSB receiver-Noise in FM receiver-Capture and threshold effect-Pre-emphasis and de-emphasis in FM system-Comparison of noise performance of AM and FM systems.

Unit V **PULSE ANALOG MODULATION** **9 Hours**

PAM-PWM-PPM-Time Division Multiplexing-PFM- Pulse Time Modulation systems: generation –detection-Sampling of Band limited Low pass signals-ideal and practical sampling- Anti aliasing and reconstruction filters

Total: 45 Hours

Further Reading:

Working principle of MODEM, AM /FM broadcasting, Design of AM and FM radio, Television Receivers.

Course Outcomes:

SKill Development / Employability

After completion of the course, Student will be able to

1. Derive the mathematical model for time domain representation, spectrum and methods of generation and detection of different AM systems.
2. Derive the mathematical model for time domain representation, spectrum and methods of generation and detection of angle modulation systems.
3. Analyze and characterize the different types of random process.
4. Compare noise in AM and FM systems.
5. Analyze the bandwidth requirements and noise performance for Pulse analog modulation

References:

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

1. J.G. Proakis, "Digital Communications", McGraw Hill, 5th edition, 2007
2. Simon Haykin, Communication Systems, John Wiley, 2001.
3.Jack Quinn, 'Digital Data Communication", Prentice Hall; 1st edition,-199)
3. P.Michael Fitz, Fundamentals of Communication System, Tata McGraw-Hill -2008.
4. P.Rama Krishna rao, Analog Communication, Tata McGraw-Hill -2011
5. Taub and Schilling, Principles of communication systems, Tata McGraw-Hill, 1995.
6. Bruce Carlson et al, Communication systems, McGraw-Hill,2002.
7. Roddy and Coolen, Electronic communication, PHI, 2003.

1702EC502	ANTENNAS AND WAVE PROPOGATION	L	T	P	C
		3	0	0	3

Course Objectives:

1. To introduce the fundamental principles of antenna theory and various types of antennas.
2. Applying the principles of antennas to the analysis, design, and measurements of antennas.
3. To introduce the propagation of radio waves.

Unit I **FUNDAMENTALS OF RADIATION** **9 Hours**

Definition of antenna parameters – Gain, Directivity, Effective aperture, Radiation Resistance, Band width, Beam width, Input Impedance, Matching – Baluns, Polarization mismatch, Antenna noise temperature, Radiation from oscillating dipole, Half wave dipole. Folded dipole, Yagi array.

Unit II **ANTENNA ARRAYS** **9 Hours**

N element linear array, Pattern multiplication, Broadside and End fire array – Concept of Phased arrays, Adaptive array, Basic principle of antenna Synthesis-Binomial Arrays, Tchebychev polynomial

Unit III **APERTURE AND SLOT ANTENNAS** **9 Hours**

Radiation from rectangular apertures, Uniform and Tapered aperture, Horn antenna , Reflector antenna , Aperture blockage , Feeding structures , Slot antennas ,Microstrip antennas – Radiation mechanism – Application ,Numerical tool for antenna analysis

Unit IV **SPECIAL ANTENNAS** **9 Hours**

Principle of frequency independent antennas –Spiral antenna, Helical antenna, Log periodic. Modern antennas- Reconfigurable antenna, Active antenna, Dielectric antennas, Electronic band gap structure and applications, Antenna Measurements-Test Ranges, Measurement of Gain, Radiation pattern, Polarization, VSWR

Unit V **PROPAGATION OF RADIO WAVES** **9 Hours**

Modes of propagation , Structure of atmosphere , Ground wave propagation , Tropospheric propagation , Duct propagation, Troposcatter propagation , Flat earth and Curved earth concept Sky wave propagation – Virtual height, critical frequency , Maximum usable frequency – Skip distance, Fading , Multi hop propagation

TOTAL: 45 PERIODS

Total: 45 Hours

Further Reading:

Concept and benefits of smart antennas, Fixed weight beamforming basics, Adaptive beamforming

Course Outcomes:

After completion of the course, Student will be able to

1. To introduce the fundamental principles of antenna theory and various types of wire antennas.
2. To design and analyze Antenna arrays
3. To know the applications of some basic and practical configurations such as dipoles, loops, and broadband, aperture type and horn antennas.
4. Applying the principles of antennas to the analysis, design, and measurements of antennas
5. To introduce different modes of propagation of radio waves

References:

Entrepreneurship

Dr.S.RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
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1.John D Kraus, Ronald J Marhefka, Ahmad S Khan, Antennas for All Applications, 3rd Edition, TheMcGraw Hill Companies. 2010.
2.K. D. Prasad, "Antenna & Wave Propagation", SatyaPrakashan, New Delhi
3.John D Kraus, " Antenna& Wave Propagation", 4th Edition, McGraw Hill, Communications and Networking, Morgan Kaufmann Publishers, An Imprint of Elsevier, 2008.
4.C.A. Balanis, "Antenna Theory - Analysis and Design", John Wiley.
5.Vijay K Garg, Wireless Communications and Netwoking, Morgan Kaufmann Publishers, An Imprint of Elsevier, 2008.

17EC503		Digital Signal Processing	L	T	P	C
			3	2	0	4
		B.E – ECE				

Course Objectives:

1. To study about a programmable Digital signal processor.
2. To learn discrete Fourier transform, properties and its computation
3. To know the characteristics of IIR filter and to learn the design of IIR filters for filtering undesired signals.
4. To know the characteristics ofFIR filter and to learn the design of FIR filter for filtering undesired signals.
5. To understand Finite word length effects and DSP Applications.

Unit I **DISCRETE FOURIER TRANSFORM** **9 Hours**

Discrete Signals and Systems- A Review – Introduction to DFT – Properties of DFT – Circular Convolution - Filtering methods based on DFT – FFT Algorithms –Decimation in time Algorithms, Decimation in frequency Algorithms – Use of FFT in Linear Filtering.

Unit II **IIR FILTER DESIGN** **9 Hours**

Structures of IIR – Analog filter design – Discrete time IIR filter from analog filter – IIR filter design by Impulse Invariance, Bilinear transformation, Approximation of derivatives – (LPF, HPF, BPF, BRF)filter design using frequency translation.

Unit III **FIR FILTER DESIGN** **9 Hours**

Structures of FIR – Linear phase FIR filter – Fourier Series - Filter design using windowing techniques(Rectangular Window, Hamming Window, Hanning Window), Frequency sampling techniques – Finite word length effects in digital Filters: Errors, Limit Cycle, Noise Power Spectrum.

Unit IV **FINITE WORDLENGTH EFFECTS AND DSP APPLICATIONS** **9 Hours**

Fixed point and floating point number representations – Quantization- Truncation and Rounding errors - Quantization noise – quantization error – Overflow error – Round off noise power - limit cycle oscillations due to product round off and overflow errors –DSP applications -Multirate signal processing: Decimation, Interpolation, Adaptive Filters.

Unit V **DIGITAL SIGNAL PROCESSORS** **9 Hours**

Introduction – TMS320c5X Architecture – Features – Addressing Formats – Functional modes - Introduction to Commercial DSP Processors –TMS320C64XX, TMS320 C54X.

Total: 45+15 Hours

Further Reading: http://www.ti.com/processors/dsp/overview.html

- Spectrum estimation.
- Linear estimation and prediction

Course Outcomes:

After completion of the course, Student will be able to

1. gain the knowledge about DSP Processors.
2. apply DFT for the analysis of digital signals & systems.
3. design of IIR filters for filtering undesired signals.
4. design of FIR filters for filtering undesired signals.
5. characterize finite Word length effect on filters and to design the Multirate Filters and Adaptive Filters.

References:

1. J.G. Proakis and D.G. Manolakis, 'Digital Signal Processing Principles, Algorithms and Applications', Pearson Education, New Delhi, PHI. 2003.
2. S.K. Mitra, 'Digital Signal Processing – A Computer Based Approach', McGraw Hill Edu, 2013.

Entrepreneurship

Employability

Employability

Entrepreneurship

Dr. S. RAMABALAN M.E., Ph.D.
PRINCIPAL
E.G.S. Pillay Engineering College,
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4. B.Venkataramani and M.Bhaskar, "Digital Signal Processors – Architecture, Programming and Applications" – Tata McGraw – Hill Publishing Company Limited. New Delhi, 2003.

3. Robert Schilling & Sandra L.Harris, Introduction to Digital Signal Processing using Matlab", Cengage Learning,2014.

5. R. Lakshmi Rekha, "Digital Singal Processing" – ALR Publications – 2016.

1702EC504	COMPUTER NETWORKS	L	T	P	C
		3	0	0	3
	(Common to B.E / B.Tech – CSE, IT & ECE)				

Course Objectives:

1. To understand networking concepts and basic communication model
2. To understand network architectures and components required for data communication.
3. To analyze the function and design strategy of physical, data link, network layer and transport layer
4. To acquire basic knowledge of various application protocol for internet security issues and services.

Unit I	INTRODUCTION AND CONCEPTS OF NETWORKS	9 Hours

Networks – Categories of Networks –Network hardware– Network software– Network Architecture – TCP/IP reference models – Network LAN technologies - Transmission media.

Unit II	DATA LINK LAYER AND PHYSICAL LAYER	9 Hours

Data link layer: Functionality of data link layer- Data link control and protocols – Error Detection and Error Correction - MAC -- Ethernet- Wireless LAN- Broadband wireless – Bluetooth – Data link layer switching – **Physical layer:** Basis for data communication- Wireless transmission- Transmission media- Multiplexing- Channel capacity- switching

Unit III	NETWORK LAYER	9 Hours

Network layer – Functionality of network layer- Network addressing- Network routing- Routing algorithms- Internetworking- Quality of service- Network layer protocols- Switching concepts – Circuit switching – Packet switching- Network layer design issues.

Unit IV	TRANSPORT LAYER	9 Hours

Functionality of transport layer- Transport layer service – Elements of transport protocols- Transmission control protocol– Congestion control and avoidance – User datagram protocol- Delay tolerant networking- Transport for Real Time Applications (RTP).

Unit V	APPLICATIONS AND SECURITY	9 Hours

Applications protocols– Client and server model- Network services- DES- RSA- Web security- Recent trends, development and issues

Total: 45 Hours

Further Reading:

1. Socket Programming
2. Connectionless Transport " UDP

Course Outcomes:

After completion of the course, Student will be able to

1. Able to trace the flow of information from one node to another node in the network
2. Able to Identify the components required to build different types of networks
3. Able to understand the functionalities needed for data communication into layers
4. Able to choose the required functionality at each layer for given application
5. Able to understand the working principles of various application protocols and fundamentals of security issues and services available.

References:

1. Achyut S Godbole,AtulHahate, " Data Communications and Networks", Second edition 2011
2. Andrew S.Tanncnbaum David J. Wetherall, "Computer Networks" Fifth Edition , Pearson Education 2011
3. Douglas E. Comer, ––Internetworking with TCP/IP (Volume I) Principles, Protocols and Architecturel, Sixth Edition, Pearson Education, 2013.
4. Forouzan, " Data Communication and Networking", Fifth Edition , TMH 2012.
5. James F. Kurose, Keith W. Ross, "Computer Networking: A Top-down Approach, Pearson Education, Limited, sixth edition,2012.

6. Larry L. Peterson & Bruce S. Davie, "Computer Networks – A systems Approach", Fifth Edition, Morgan Kaufmann, 2012
7. William Stallings, —Data and Computer Communicationsl, Tenth Edition, Pearson Education, 2013

1702EC551	ANALOG COMMUNICATION LABORATORY	L	T	P	C
		0	0	4	2

Course Objectives:	**The student should be made to:**
	1. Understand the basics of analog communication.
	2. Study the different modulators.
	3. Know the noise performance in communication system.

List of Experiments:

1. Generation and Demodulation of AM.
2. Generation and Demodulation of FM.
3. FM modulation using PLL.
4. Study of PAM,PWM and PDM
5. Study of FDM and TDM.
6. Generation of AM using MATLAB.
7. Generation of FM using MATLAB.
8. Study of Super heterodyne receiver.
9. Performance analysis of noise in Communication system.
10. Removal of noise in AM and FM.

Total: 45 Hours

Additional Experiments:	Pace Maker Circuit
	Industrial Instrumentation amplifier
Course Outcomes:	
	After completion of the course, Student will be able to
	1. Design of AM and FM Circuits.
	2. Design of AM and FM Circuits using MATLAB.
	3. Determine the different multiplexing technique.
	4. Design of Super Heterodyne receiver.
	5. Compute the noise performance in communication system.

1702EC552	DIGITAL SIGNAL PROCESSING LAB	L	T	P	C
		0	0	4	2
	(Common to B.E / B.Tech – ECE,CSE & IT)				

Course Objectives:	**The student should be made to:**
	1. To make the students understand the behavior and response of the filter using different methods
	2. To study the output response of the system, sampling rate conversion and FFT spectrum
	3. To know the generation of the signals and arithmetic operations using TMS320C5X DSP Processor.

List of Experiments:

1. Generation of Signals
2. Properties of Discrete time Systems-Linearity, Stability, Causality &Time Variance.
3. Sampling of an audio signal with different sampling rate and reconstruct the sampled signal.
4. Computation of DFT of a signal using basic equation and FFT & power spectrum estimation using DFT
5. Design and Simulation of IIR filters.
6. Design and Simulation of FIR filters
7. Multirate signal processing-Down sampling , Up sampling , Decimation and Interpolation

8. Arithmetic operations in DSPs	
9. Generation of waveforms using DSPs	
10. Computation of convolution and correlation between signals using DSPs	
11. Implementation of IIR Filters using DSPs	
12. Implementation of FIR Filters using DSPs	
Total:	**45 Hours**
Additional Experiments:	https://www.texasinstruments.in
	Basic experiments using ADSP processor
Course Outcomes:	
After completion of the course, Student will be able to	
1. Design of digital filter and Generation of various signals, Analysis of signal and system properties.	
2. Computation of circular and linear convolution.	
3. Determine the frequency transformation and Analysis of sampling rate.	
4. Design of digital filters.	
5. Analyze the power spectral density of the system.	

TECHNICAL SEMINAR	L	T	P	C
	0	0	2	1

Course Objectives: **The student should be made to:**

1. To develop self-learning skills of utilizing various technical resources to make a technical presentation.
2. To promote the technical presentation and communication skills.
3. To impart the knowledge on intonation, word and sentence stress for improving communicative competence, identifying and overcoming problem sounds.
4. To promote the ablility for Interacting and sharing attitude.
5. To encourage the commitment-attitude to complete tasks.

The students are expected to make two presentations on advanced topics (recent trends) related to III or IV semester subjects. A faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also. Students are encouraged to use various teaching aids such as power point presentation and demonstrative models

Evaluation Scheme: **Continuous Assessment (100)**

Distribution of marks for Continuous Assessment:

Presentation I (40) Report (10)
Presentation II (40) Report (10)

Total Marks (100)

Total:	**45 Hours**
Course Outcomes:	
After completion of the course, Student will be able to	
1. Identify and utilize various technical resources available from multiple field.	
2. Improve the technical presentation and communication skills.	
3. Improve communicative competence.	
4. Interact and share their technical knowledge.	
5. Understand and adhere to deadlines and commitment to complete the assignments.	

		LIFE SKILLS: APTITUDE - I	**L**	**T**	**P**	**C**
			0	**0**	**2**	**1**
		B.E – ECE				

Course Objectives:

1. To brush up problem solving skill and to improve intellectual skill of the students
2. To be able to critically evaluate various real life situations by resorting to Analysis Of key issues and factors
3. To be able to demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.
4. To enhance analytical ability of students
5. To augment logical and critical thinking of Student

Unit I	**INTRODUCTION TO NUMBER SYSTEM, BASIC SHORTCUTS OF ADDITION, MULTIPLICATION, DIVISION**	**5 Hours**

Classification of numbers – Types of Numbers - Divisibility rules - Finding the units digit - Finding remainders in divisions involving higher powers - LCM and HCF Models - Fractions and Digits – Square, Square roots – Cube, Cube roots – Shortcuts of addition, multiplication, Division.

Unit II	**Ratio and proportion, Averages**	**5 Hours**

Definition of Ratio - Properties of Ratios - Comparison of Ratios - Problems on Ratios - Compound Ratio - Problems on Proportion, Mean proportional and Continued Proportion Definition of Average - Rules of Average - Problems on Average - Problems on Weighted Average - Finding average using assumed mean method.

Unit III	**Percentages, Profit And Loss**	**5 Hours**

Introduction Percentage - Converting a percentage into decimals - Converting a Decimal into a percentage - Percentage equivalent of fractions - Problems on percentages - Problems on Profit and Loss percentage- Relation between Cost Price and Selling price - Discount and Marked Price - Two different articles sold at same Cost Price - Two different articles sold at same Selling Price - Gain% / Loss% on Selling Price.

Unit IV	**Coding and decoding, Direction sense**	**5 Hours**

Coding using same set of letters - Coding using different set of letters - Coding into a number - Problems on R-model - Solving problems by drawing the paths - Finding the net distance travelled - Finding the direction - Problems on clocks - Problems on shadows - Problems on direction sense using symbols and notations.

Unit V	**Number and letter series Number and Letter Analogies, Odd man out**	**5 Hours**

Difference series - Product series - Squares series - Cubes series - Alternate series - Combination series - Miscellaneous series - Place values of letters - Definition of Analogy - Problems on number analogy - Problems on letter analogy - Problems on verbal analogy - Problems on number Odd man out - Problems on letter Odd man out - Problems on verbal Odd man out

Total:	**30 Hours**

ASSESSMENT PATTERN :

1. Two tests will be conducted (25 * 2) - 50 marks
2. Five assignments will be conducted (5*10) - 50 Marks

Skill Development

Course Outcomes:

After completion of the course, Student will be able to

1. Learners should be able to understand number and solving problems least time using various shortcut
2. Solve problems on averages; compare two quantities using ratio and proportion.
3. Calculate concept of percentages, implement business transactions using profit and loss.
4. Workout concepts of Coding and Decoding, ability to visualize directions and understand the logic behind a sequence.
5. Learners should be able to find a series the logic behind a sequence.

References:

1. Arun Sharma, 'How to Prepare for Quantitative Aptitude for the CAT', 7th edition, McGraw Hills publication, 2016.
2. Arun Sharma, 'How to Prepare for Logical Reasoning for CAT', 4th edition, McGraw Hills publication, 2017.
3. R S Agarwal, 'A modern approach to Logical reasoning', revised edition, S.Chand publication, 2017.
4. R S Agarwal, 'Quantitative Aptitude for Competitive Examinations', revised edition, S.Chand publication, 2017.
5. Rajesh Verma, "Fast Track Objective Arithmetic", 3rd edition, Arihant publication, 2018.
6. B.S. Sijwalii and Indu Sijwali, "A New Approach to Reasoning Verbal & Non-Verbal", 2nd edition, Arihnat publication, 2014.

Dr. S. RAMABALAN, M.E., Ph.D.
PRINCIPAL
E.G.S. Pillay Engineering College
Thethi, Nagore - 611 002.
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1703EC501	NANO ELECTRONICS	L	T	P	C
		3	0	0	3
	(Common to B. E / B. Tech – CSE, IT & ECE)				

Course Objectives:

1. To be exposed of basic electronics and quantum electronics.
2. To be familiar with basic Nano electronics devices and Plasmonics.
3. To learn about optoelectronics and Spintronics.
4. To know various architecture methodologies

Unit I	**INTRODUCTION TO ELECTRONICS AND QUANTUM DEVICES:**	**9 Hours**

Classification Of Solids-Energy Level-Intrinsic and Extrinsic Semiconductor-Conduction In Metal And Semiconductor-Semiconductor Diodes-Basic Principle Of Led-Charge And Spin In Single Quantum Dots-Coulomb Blockade-Electrons In Mesoscopic Structures-Single Electron Transfer Devices (Sets)-Electron Spin Transistor –resonant tunnel diodes ,tunnel FETs-quantum interference transistors devices(QUITs)-quantum dot cellular automata(QCAs)-quantum bits(qubits)

Unit II	**NANOELECTRONICS DEVICES AND PLASMONICS:**	**9 Hours**

Electronic transport in 1,2 and 3 dimensions-quantum confinement –energy sub bands –effective mass-diode conduction-mean free path in 3D-ballistic conduction –phase coherence length –quantized conductance-buttiker-landauer formula-electron transport in pn junctions-short channel nano transistor - single photon transistor using surface plasmon-nanowire surface plasmons-interaction with matter-channel plasmon-polarising guiding by sub wavelength metal groves-surface plasmon polarizations and localized surface plasmon.

Unit III	**OPTOELECTRONIC CRYSTAL ANS ITS FABRICATION:**	**9 Hours**

Linear optonic crystal –maxwells equations bloch's theorem transmission spectra –non linear optics in linear optonic crystals slab –nonlinear optonic crystal and its application-fabrication of optonic crystals structures(1D,2D&3D)-applications;1D crystals -coupler waveguide-high-Q cavities –optonic crystal fiber-4 tunable optonic crystal filters.

Unit IV	**SPINTRONICS:**	**9 Hours**

Spin tunnelling devices-magnetic tunnel junction –tunnelling spin polarization –giant tunnelling using MgO tunnel barriers-tunnel-based spin injectors-spin injections and spin transport in hybrid nanostructures –spin filters -spin diodes –magnetic tunnel transistor-spin relaxation and spin dephasing-memory devices and sensors-ferroelectric random access memory-MRAMS-field sensors –multferro electric sensors-spintronic biosensors

Unit V	**NANOELETRONIC ARCHITECTURES AND COMPUTATIONS**	**9 Hours**

Architecture principles-mono and multi processor systems-parallel data processing –power dissipation and parallelism –classic systolic arrays –molecular devices-properties –self-organization –size dependent limitations,computation:montecarlo simulations –computational methods and simulations from ab initio multiscale modelling –modelling of nanodevices

	Total:	**45 Hours**

Further Reading:

1. Quantum Dots for fiber optic communication
2. Quantum cellular automata

Employability / Entrepreneurship

Course Outcomes:

After completion of the course, Student will be able to

1. Explain the theory, principle of basic electronics and quantum electronics.
2. Explain the characteristics of Nano electronics and Plasmonic devices.
3. Summarize the various type's Optoelectronic crystals and its working principle.
4. Explain the characteristics, theory and construction of Spintronics devices.
5. Design an architecture Nanoelectronics system design

References:

1. W.Rainer,Nano electronics and information technology,wiley, 3rd 2012.
2. K.E.Drexlex,Nanosystems,Wiley, revised edition 2014
3. M.C.Gupta,J.Balloto the Handbook of photonics. CRC Press Taylor and Francis Group, 2nd edition 2006.
4. J.M.Martinez-Durat,RaulJ.Martin-palma."Nanotechnology for microelectronics and optoelectronics", 1st edition, 2006, Elsevier.
5. V.Kochelp,M.stroscio.''Introduction to nanoelectronics,Cambridge university press(2013).
6. RainerWaser,''Nano electronics and information technology;advanced electronic material and novel devices'',Wiley-VCH(2010).

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

1703EC502	AUTOMOTIVE ELECTRONICS	L	T	P	C
		3	0	0	3

Course Objectives:

To learn Automotive mechanical, transmission and braking systems and to update the latest trends followed in the industry.

Unit I	**AUTOMOTIVE MECHANICAL SYSTEMS: VEHICLE SYSTEMS**	**9 Hours**

Power Train System (Air System, Fuel System (Carburettor& Diesel Fuel Injection, Ignition System, Exhaust System and other Auxiliary Systems (Cooling, Lubrications & Electrical Systems)), Transmission System (Front, Rear &4 wheel Drive, Manual, Automatic Transmission, Differential). Braking System (Drum, Disc, Hydraulic, Pneumatic). Steering System (Rack and Pinion, Power Steering).

Unit II	**ELECTRONICS IN AUTOMOTIVE SYSTEMS**	**9 Hours**

Need for Electronics in Automotive Systems: Performance (Speed, Power, and Torque), Control (Emission, Fuel Economy, Drivability, and Safety) & Legislation (Environmental legislation for pollution & Safety Norms). Overview of Vehicle Electronic Systems: Basic electrical components and their operation in an automobile: Power train subsystem (Starting systems, Charging systems - Ignition systems – Electronic fuel control), Chassis subsystem (ABS, TCS, & ESP) – Comfort and safety subsystems (Night Vision, Airbags, Seatbelt Tensioners, Cruise Control-Lane-departure-warning, Parking).

Unit III	**INTEGRATED DEVELOPMENT ENVIRONMENT**	**9 Hours**

Introduction to Integrated development environment (IDE) – Getting started, HW / SW configuration (boot service, Host – target interaction) – Booting reconfiguration – Managing IDE – Target servers, agents, Cross development, debugging – Introduction to an IDE for lab board – RTOS, PC based debugger

Unit IV	**EMBEDDED SYSTEM IN AUTOMOTIVE APPLICATIONS**	**9 Hours**

Engine management systems – Gasoline / Diesel systems, various sensors used in system – Electronic transmission control - Vehicle safety system – Electronic control of braking and traction – Body electronics – Infotainment systems – Navigation systems – System level tests – Software calibration using engine and vehicle dynamometers – Environmental tests for Electronic Control Unit - Application of Control elements and control methodology in Automotive System.

Unit V	**EMBEDDED SYSTEM COMMUNICATION PROTOCOLS**	**9 Hours**

Introduction to control networking – Communication protocols in embedded systems – SPI, I2C, USB – Vehicle communication protocols – Introduction to CAN, LIN, FLEXRAY, MOST, KWP2000

	Total:	**45 Hours**

Further Reading: Heat Combustion – Fast moving acceleration –ABS – Fuel Injector

Course Outcomes:

After completion of the course, Student will be able to

1. Describe various mechanical systems in an automobile
2. Illustrate different types of electronic systems in an automobile
3. Outline the various stages of Integrated development environment to design an embedded system
4. Explain the various embedded systems used in automotive applications
5. Compare Vehicle Communication Protocols (K3).

References:

1. JoergSchaeuffele, Thomas Zurawka, —Automotive Software Engineering Principles, Processes, Methods and Tools‖, SAE International, 2005.
2. BOSCH Automotive Handbook, 6th Edition, 2014.
3. Jean J.Labrosse, —µC/OS-II Real Time Kernel,CMP Books‖, 2nd edition, 2002.
4. Denton. T, —Automobile Electrical and Electronic Systems‖, 4th edition, 2012.
5. Ronald K. Jurgen, ---Automotive Electronics Handbook‖, McGraw Hill Publications, 1999.
6. Nicholas Navit, ---Automotive Embedded System Handbook‖, CRC Press, Taylor and Francis Group, 2009.

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

1703EC503	MICROELECTRONICS	L	T	P	C
		3	0	0	3
	(Common to B. E / B. Tech – CSE, IT & ECE)				

Course Objectives:

1. To be exposed of basics of semiconductor and applications.
2. To be familiar with advanced semiconductors and its applications.
3. To study the different types of amplifiers and its types.
4. To know about fabrication methodologies and circuit designing.

Unit I **INTRODUCTION TO MICROELECTRONICS:** **9 Hours**

Basic physics of semiconductor-diode models and circuits-physics of MOS transistor-MOS amplifiers – operational amplifiers- semiconductor theory- diodes –bipolar junction transistor(BJT)-BJT amplifiers-field effect transistor –FET amplifiers.

Unit II **MOSFET AND IC AMPLIFIERS:** **9 Hours**

Devices structure and physical operation-VI characteristics-biasing in MOS amplifier circuits-small signal operation and models-SPICE MOSFET-IC design philosophy-comparison of MOSFET and BJT-current sources –current mirrors-current steering circuits-high frequency response.

Unit III **MULTI STAGE AMPLIFIER AND FEEDBACK:** **9 Hours**

MOS differential pair –small signal operation of MOS differential pair-BJT differential pair-other non ideal characteristics and differential pair-differential amplifier with active words-multistage amplifiers-general feedback structure-four basic feedback topologies-series,shunt feedback-determining the loop gain- stability problems-effect of feedback in amplifiers poles-frequency compensation.

Unit IV **MICROELECTRONICS FABRICATION:** **9 Hours**

Clean room technology-silicon wafer production-thermal oxidation –lithography –advanced lithography – etching-diffusion process and ion implementation-thin film deposition –packaging –yields processing-CMOS & BIPOLAR process integration-in practice-photo lithography-CVD epitaxy-plasma etching.

Unit V **MICROELECTRONIC DEVICES AND CIRCUITS:** **9 Hours**

Modelling uniform semiconductor equilibrium-Uniform excitation of semiconductors- Non uniform Situations:The Five basic equations-Non uniform Carrier Injection :Flow Problems –Non uniformly Doped Semiconductors-Junction Diodes-Bipolar Junction Transistors-The MOS capacitor-Field effect Transistors-Single Transistor Linear Amplifiers Stags-Differential Amplifiers Stages-High Frequency Analysis of Linear Amplifiers.

Total: 45 Hours

Further Reading:

1. Commercial applications of Microelectronic circuits.
2. FINFET

Course Outcomes: Employability

After completion of the course, Student will be able to

1. Explain the theory, principle of semiconductors and its devices.
2. Learn the characteristics of advanced semiconductors and its applications
3. Discuss the working principle and characteristics of different types of amplifiers.
4. Explain the fabrication methodology of microelectronics components and devices
5. Explain the various characteristics of microelectronics devices and circuits

References:

1. Claudio talarico, A.S.Sedra and K.C.Smith, "Microelctronics"5/e,oxford university press 2003.
2.Richard C.Jaeger "Introduction to microelectronic fabrication"2nd edition, Prentice Hall 2002.
3. Cliton G.Fonsand "Microelectronic devices and Circuits" Tata McGraw-2006.
4. Behzadrazavi "Fundamentals of microelectronics", John wiley India pvt,ltd, 2008.
5.Microelectronics – analysis and design,sundaram Natarajan. Tata McGraw hill.2007

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

1703EC505	ROBOTIC VISION	L	T	P	C
		3	0	0	3

Course Objectives:

1. To learn the image fundamentals and mathematical transforms necessary for robotic vision
2. To understand the image segmentation and edge detection methods
3. To study the concepts of optics and lens systems

Unit I **INTRODUCTION** **9 Hours**

Introduction to robotic vision- 2D image transform, image filtering , relationship with other related fields- image formation perspective projection- orthographic projection- brightness- lenses- image sensing- sensing color.

Unit II **IMAGE SEGMENTATION & EDGE DETECTION** **9 Hours**

Simple geometrical properties- area & position- orientation- projection- run length coding topological properties- sequential labeling algorithm- local counting & iterative modification. Image segmentation- thresholding- histogramming- merging and splitting algorithm- edges in images-differential operators- discrete approximations- edge detection and localization

Unit III **IMAGE RECOGNITION** **9 Hours**

Future Extraction, Transform Based, Sift, Image Classification, Bayes Classification, Svm, Deep Learning

Unit IV **VIDEO ANALYTICS** **9 Hours**

Video surveillance, four ground extraction, pedestrian deduction, video analytics for navigation, abounded objects deduction

Unit V **MACHINE LEARNING** **9 Hours**

Learning –Types of Machine Learning –Supervised Learning –The Brain and the Neuron –Design a Learning System – Perspectives and Issues in Machine Learning –Concept Learning Task –Concept Learning as Search – Finding a Maximally Specific Hypothesis –Version Spaces and the Candidate Elimination Algorithm –Linear Discriminants – Perceptron –Linear Separability –Linear Regression.

Total: 45 Hours

Further Reading:

Robot Vision in Industrial Assembly and Quality Control Processes-Multi-Task Active-Vision in Robotics-An Approach to Perception Enhancement in Robotized Surgery using Computer Vision

Entrepreneurship/Employability

Course Outcomes:

After completion of the course, Student will be able to

1. Identify the basic concepts of robotic vision and image formation
2. Analyze the geometric and topological properties of binary images
3. Apply the edge detection and segmentation techniques on real time images
4. Diagnose the degree of complications involved in optics related to robotic vision
5. Analyze the applications of robotic vision systems

References:

1. C.Rafeal Gonzalez and E.Richard Woods, Digital Image Processing, Third Edition, Pearson Education 2008.
2. Christopher M.Bishop "Pattern Recognition and Machine Learning", 2nd printing 2011 edition.
3. Richard Duda, Peter Hart, David Stork, "Pattern Classification", Publisher: Wiley; Second edition 2007.
4. Berthold Klaus paul horn, Robot vision, The MIT Press, McGraw Hill, 2012
5. Ales Ude, Robot vision, In-tech,2010
6. Ramesh Jain, Rangachar Kasturi and Brian G. Schunck, Machine Vision, McGraw Hill, 2006.
7. Anil K. Jain, Fundamentals of Digital Image Processing, PHI, 2006.

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

17EC006	COMPUTER ARCHITECTURE AND ORGANIZATION	L	T	P	C
		3	0	0	3
	(Common to B.E / B.Tech – CSE, IT & ECE)				

Course Objectives:

1. Describe software and hardware interaction layers in computer architecture
2. Describe central processing unit
3. Describe various machine language instructions
4. Describe various addressing modes
5. Describe various instruction types and Instruction cycle

Unit I	INTRODUCTION OF COMPUTER ORGANIZATION AND DATA REPRESENTATION IN COMPUTER SYSTEM	9 Hours

Main Components of Computers, Standard Organization, Historical Developments, Computer Level Hierarchy, Von Neumann and Non-Von Neumann Model, Positional Numbering Systems, Signed Integer Representation, Fixed and Floating Point Representation, Character Codes, Codes for Data Recording and Transmission, Error Detection and Error Correction.

Unit II	SIMPLE COMPUTER AND INSTRUCTION SET ARCHITECTURE	9 Hours

Introduction, MARIE, Instruction Processing, Simple Program, Hardwired Control, Micro programmed Control, Real World Example of Computer Architecture, Instruction Formats, Instruction Types, Addressing, Instruction Level Pipelining, Real World Example of ISA

Entrepreneurship

Unit III	MEMORY AND STORAGE SYSTEM	9 Hours

Memory - Classification of memories – ROM - ROM organization - PROM – EPROM – EEPROM –EAPROM, RAM – RAM organization, Memory Hierarchy, Cache and Virtual Memory, Interfacing Memory to a Processor, Real World Example of Memory Management, Amdahl's Law, I/O Architecture, External Memory - Optical Disk, Magnetic Tape, RAID, Solid State Drives, Data Compression, Computer Peripherals, Operating System Support.

Unit IV	PARALLEL ORGANIZATION AND ALTERNATIVE ARCHITECTURE	9 Hours

Parallel Processing – Multiple Processor Organization, Cache Coherence and MESI Protocol, Multi Core Computer – Hardware and Software Performance Issues, Intel X86 Multicore Organization, RISC Machines, Flynn's Taxonomy, Parallel and Multiprocessor Architecture, Alternative Parallel Processing Approaches.

Unit V	SYSTEM SOFTWARE AND PERFORMANCE MEASUREMENTS	9 Hours

Operating Systems, Protected Environments, Programming Tools, Database Software, Transaction manager, Computer Performance Equation, Mathematical Preliminaries, Bench Marking, CPU Performance Optimization, Disk Performance.

	Total:	45 Hours

Further Reading:

1. Input–Output Design and Organization, Data Formats
2. Modern Computer Systems, Communication Channel Technology

Course Outcomes:

Entrepreneurship

After completion of the course, Student will be able to

1. Describe historical overview of computer and Numerical Representation Techniques.
2. Illustrate different types of Fundamental Computer Organization and Instruction Set.
3. Outline the Basic Memory Concept and External Storing Devices.
4. Explain the various Processing in Emerged in Recent Years.
5. Compare the Various Performance Analysis and System Software.

References:

1.David Tarnoff, "Computer Organization and Design Fundamentals", First Edition, 2007.

2. M. Morris Mano, "Computer System Architecture", 3rd Edition, Publisher: Pearson 2011.

3.MostafaAbd-El-Barr, Hesham El-Rewini, "Fundamentals of Computer Organization and Architecture", Wiley Inter science, John Wiley & Sons, Inc Publication, 2005.

4.Irv Englander, "The Architecture of Computer Hardware, System Software, and Networking", John Wiley & Sons, Inc Publication, 2009.

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

1703EC504	BIOMEDICAL ENGINEERING	L	T	P	C
		3	0	0	3

Course Objectives:

1. To gain knowledge about the various physiological parameters and the methods of recording and also the method of transmitting these parameters.
2. To study about the various assist devices used in the hospitals and Biotelemetry.
3. To gain knowledge about various recently developed diagnostic and therapeutic techniques.

Unit I	**PHYSIOLOGIC SYSTEM AND BIO-POTENTIAL RECORDING**	**9 Hours**

The origin of Bio-potentials, Bio potential electrodes, Endocrine System, Nervous system, Vision system, Respiratory System, ECG, EEG, EMG,PCG, lead systems and recording methods, typical waveforms and signal characteristics.

Unit II	**BIOLOGICAL AMPLIFIERS AND NON- ELECTRICAL PARAMETER MEASUREMENT**	**9 Hours**

Biological amplifier, Blood flow meter, Cardiac output, Respiratory measurement, Blood pressure, Temperature, Pulse, Blood Cell Counters.

Unit III	**ASSIST DEVICES AND DIATHERMY**	**9 Hours**

Cardiac pacemakers, DC Defibrillator, Dialysis, Shortwave, Ultrasonic and Microwave type and their applications, Surgical Diathermy

Unit IV	**BIOTELEMETRY AND ITS APPLICATIONS**	**9 Hours**

Introduction to Biotelemetry, Component of Biotelemetry, Application of Biotelemetry, Radio pill, Electrical safety.

Unit V	**RECENT TREND IN IMAGING SYSTEM AND MEDICAL INSTRUMENTS**	**9 Hours**

X-Ray machines and Digital radiography, Biological effect of NMR imaging and Ultrasound, Medical Thermography, Endoscope unit, Laser in medicine, Cryogenic application, Computer tomography

Total: 45 Hours

Further Reading:

1. Human Anatomy
2. Biological Electrodes
3. Recent trend in medical application.

Course Outcomes:

After completion of the course, Student will be able to

1. Classify various Bio-Signals and Waveform in Medical Science
2. Explain the Biological amplifiers and Non electrical parameter measurement.
3. Identify the devices in Medical field for particular application
4. Discuss the application of Biotelemetry.
5. Illustrate recent trends in medical Science

References:

1. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Prentice Hall of India, New Delhi, 2007.
2. John G.Webster, "Medical Instrumentation Application and Design", 3rd Edition, Wiley India Edition, 2007.
3. Khandpur, R.S., "Handbook of Biomedical Instrumentation", TATA McGraw - Hill, New Delhi, 2003.
4. JosephJ.Carr and John M.Brown, "Introduction to Biomedical Equipment Technology", John Wiley and Sons, New York, 2004.
5. Joseph D.Bronzino,"The Biomedical Engineering Hand Book",Second Edition, CRC Press,2000.

1703EC507	ADVANCED MICROCONTROLLERS	L	T	P	C
		3	0	0	3

Course Objectives:

1. To study about concepts of PIC and 8031/8051Microcontrollers
2. To know about Motorola Microcontroller
3. To explore knowledge about applications of Microcontrollers
4. To understand various system design Techniques

Unit I	**8051/8031 MICROCONTROLLERS**	**9 Hours**

Introduction to single chip microcontrollers Intel MCS – 51 family features, 8051/8031 architecture, pin configuration, I/O ports and Memory organization. Instruction set and basic assembly language programming

Unit II	**PIC MICROCONTROLLER**	**9 Hours**

Introduction to PIC micro -controller ,CPU Architecture – Instruction set – interrupts- Timers- I2C Interfacing –UART- A/D Converter –PWM and introduction to C-Compilers

Unit III	**MOTOROLA 68HC11 MICROCONTROLLERS**	**9 Hours**

Instruction set addressing modes – operating modes- Interrupt system- Serial Communication Interface – A/D Converter.

Unit IV	**INTERFACING AND APPLICATIONS OF MICRO CONTROLLERS**	**9 Hours**

Interrupts, Timer/Counter and Serial Communication. Interfacing LCD Display – Key pad Interfacing, MCS applications: Square wave and pulse wave generation, LED, A/D Converter and D/A Converter interfacingto8051.

Unit V	**SYSTEMDESIGN– CASESTUDIES**	**9 Hours**

Generation of Gate signals for converters and Inverters-Motor Control–Controlling DC/ AC appliances–Measurement of frequency-Stand alone Data Acquisition System.

Total:	**45 Hours**

Further Reading:

1.RTC- Interface with Motorola Microcontroller, PWM
2.UART- Interface with 68HC11 Motorola Microcontroller

Employability/Entrepreneurship

Course Outcomes:

After completion of the course, Student will be able to

1. know basics of 8031/8051 Microcontrollers
2. Explain fundamentals of PIC Controller
3. understand concepts of Motorola 68HC11 Microcontrollers
4. Illustrate system design techniques using Microcontroller
5. examine applications and interfacing of Microcontroller

References:

1. Muhammed Ali Mazidi and Janice Gillispie Mazidi – The 8051 Microcontroller and Embedded Systems Using Assembly and C,II edition , Pearson Education Inc, 2012.
2. Muhammad Ali Mazidi, Rolin D.Mckinlay, Danny Causey 'PIC Microcontroller and Embedded Systems using Assembly and CforPIC18', Pearson Education 2008.
3. John .B.Peatman , " Design with PIC Microcontroller . Prentice hall, 1997.
4. AjayV Deshmukh–Microcontrollers Theory and Applications, Tata McGraw-Hill, 2015
5. Gene .H.Miller ." Micro Computer Engineering ," Pearson Education , 2003
6. Rajkamal,".Microcontrollers-Architecture,Programming,Interfacing&System Design",2ed,Pearson,2012
7. IScott Mackenzie and Raphael C.W. Phan,"The Microcontroller", Pearson , Fourth edition 2012

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

1703EC508	MEASUREMENT AND INSTRUMENTATION	L	T	P	C
		3	0	0	3

Course Objectives:

1. Learn the use of DC and AC bridges for measuring R, L and C
2. Learn the use of different types of analog meters for measuring electrical quantities such as current, voltage, power, energy, power factor and frequency
3. Learn the applications of CRO, other electronic measuring devices, graphical programming palettes and tools in virtual instrumentation

Unit I **MEASUREMENT CONCEPTS** **9 Hours**

Principles of operation and construction of PMMC-Static and dynamic characteristics-units and standards of measurements-error analysis-moving coil, moving iron meters, multi meters-True RMS
Meters-Bridge measurements: Maxwell, Kelvin, Hay, Schering, Anderson and Wien bridge-Q meters .

Unit II **TRANSDUCERS** **9 Hours**

Classification of transducers-selecting a transducer-strain gauges-temperature transducer – LVDT Advantages and disadvantages-capacitive transducers-Piezo electric transducers – opto electronic transducers.

Unit III **FUNCTION GENERATORS** **9 Hours**

Function generators-RF signal generators-Sweep generators-Frequency synthesizer-wave analyzer-Harmonic distortion analyzer-spectrum analyzer-heterodyne wave analyzer-frequency counters- Time Interval measurement- Measurement of voltage, current, phase and frequency using CRO.

Unit IV **VIRTUAL INSTRUMENTATION** **9 Hours**

Introduction- Block diagram of a virtual instrument physical quantities and analog interfaces- Hardware and soft ware user interface- Advantages over conventional instruments- Architecture of a virtual instruments and its relation to the operating system-overview of software-lab view- Graphical user interface-controls and indicators-labels and texts-data types – format-data flow programming – editing debugging and running a virtual instrument-graphical programming palettes and tools.

Unit V **MODERN MEASUREMENT TECHNIQUES** **9 Hours**

A/D &D/A converters-Elements of a digital data acquisition system-interfacing of transducers – multiplexing-Use of recorders in digital systems-digital recording system-liquid crystal display-computer controlled instrumentation-IEEE 488 bus-fiber optic measurements for power and system loss.

Total: 45 Hours

Further Reading:

Vector meters and distortion meters-Measurement of Pressure, Temperature, and velocity-Special typeof CRO-Front panel objects-functions and libraries-Optical time domains reflect meter.

Course Outcomes:

Entrepreneurship

After completion of the course, Student will be able to

1. Design different Bridge configurations and their applications.
2. Design different Embedded Projects using Transducers and Sensors.
3. Analyze the working of different Equipments used in Instrumentation.
4. Design different Virtual Instruments using LabVIEW Software.
5. Interface different analog components to a Computer controlled Instrumentation System

References:

1. Ernest, Doeblin, Dhanesh and N.Manik, Measurement Systems - Application and Design, Tata McGraw - Hill, 2007

2. Sawhney A K, "Electrical And Electronic Measurements And Instrumentation" **Publisher:** Dhanpat Rai & Co. 2005.

3. Albert D.Helfrick and William D.Cooper, Modern Electronic Instrumentation and Measurement Techniques, PHI, 2003

4. B.C.Nakara, K.K.Chaudhry, Instrumentation Measurement and Analysis, Tata McGraw - Hill,2004.

5. Joseph J.Carr, Elements of Electronics Instrumentation and Measurement, PHI, 2003.

6. Alan. S. Morris, Principles of Measurements and Instrumentation, PHI, 2003

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

17EC009	VIRTUAL INSTRUMENTATION	L	T	P	C
		3	0	0	3

Course Objectives:

1. Analog ic and digital measurements principles
2. Understanding Virtual Instrument concepts
3. Creating Virtual Instruments for practical works

Unit I	**Introduction to Virtual Instrumentation:**	**9 Hours**

Historical perspective – advantage block diagram and architecture of a virtual instrument -Conventional Instruments versus Traditional Instruments - data-flow techniques, graphical programming in data flow, comparison with conventional programming.

Unit II	**VI programming techniques**	**9 Hours**

VIs and sub-VIs, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, State machine, string and file I/O, Instrument Drivers, Publishing measurement data in the web.

Unit III	**Data acquisition basics**	**9 Hours**

Introduction to data acquisition on PC, Sampling fundamentals, Input/Output techniques and buses. ADC, DAC, Digital I/O, counters and timers, DMA, Software and hardware installation, Calibration, Resolution, Data acquisition interface requirements

Unit IV	**VI Chassis requirements**	**9 Hours**

Common Instrument Interfaces: Current loop, RS 232C/ RS485, GPIB. Bus Interfaces: USB, PCMCIA, VXI, SCSI, PCI, PXI, Firewire. PXI system controllers, Ethernet control of PXI. Networking basics for office & Industrial applications, VISA and IVI

Unit V	**VI toolsets, Distributed I/O modules and Applications**	**9 Hours**

. Application of Virtual Instrumentation Instrument Control, Development of process database management system. Simulation of systems using VI, Development of Control system, Industrial Communication, Image acquisition and processing, Motion control. **Applications** DistributedI/O modules-Virtual Laboratory, Virtual Oscilloscope, Virtual function generator, Motioncontrol. Development of Virtual Instrument using GUI, Real-time systems, Embedded Controller, OPC, HMI /SCADA

Total:	**45 Hours**

Further Reading:

LabVIEW Graphical Programming

Course Outcomes:

After completion of the course, Student will be able to

1. Understand importance and applications of virtual instrumentation
2. Understand basic data acquisition techniques of virtual instrumentation
3. Develop real time applications of virtual instrumentation
4. Analog and digital measurements principles
5. Understand the tool sets of virtual instrumentation

References:

1. Robert H. Bishop,LabVIEW 2009 Student Edition, Pearson College Division, 2009.
2. N.Mathivanan, PC-based Instrumentation: Concepts and Practice, Eastern Economy Edition, PHI Learning private Ltd,2007.
3. Kevin sJames, PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control, Newness, 2000.
4. Jovitha Jerome, Virtual Instrumentation Using Lab VIEW, Eastern Economy Edition, PHI Learning Private, 2010.

1702CSX01	OPERATING SYSTEMS	L	T	P	C
		3	0	0	3
	(Common to B.E / B.Tech – ECE, CSE, IT)				

Course Objectives: **The student should be made to:**

1. Study the basic concepts and functions of operating systems.
2. Understand the structure and functions of OS.
3. Learn about Processes, Threads and Scheduling algorithms
4. Understand the principles of concurrency and Deadlocks.
5. Learn various memory management schemes
6. Study I/O management and File systems.

Unit I **INTRODUCTION** **5 Hours**

Introduction- Operating System Structure – Operating System Operations – Process Management – Memory Management – Storage Management – Protection and Security – Distributed Systems –Computing Environments – System Structures: Operating System Services – User Operating System Interface – System Calls – Types of System Calls – System Programs, OS Generation and System Boot.

Unit II **PROCESS MANAGEMENT** **12 Hours**

Processes-Process Concept, Process Scheduling, Operations on Processes, Inter process Communication; Threads-Overview, Multicore Programming, Multithreading Models; Windows 7 -Thread and SMP Management. Process Synchronization - Critical Section Problem, Mutex Locks, Semophores, Monitors; CPU Scheduling and Deadlocks. Deadlock Characterization – Methods for handling Deadlocks -Deadlock Prevention – Deadlock avoidance – Deadlock detection – Recovery from Deadlocks

Unit III **MEMORY MANAGEMENT** **10 Hours**

Memory Management: Background – Swapping – Contiguous memory allocation –Paging – Segmentation – Segmentation with paging. Virtual Memory: Background –Demand paging – Process creation – Page replacement – Allocation of frames –Thrashing. Case Study: Memory management in Linux.

Unit IV **STORAGE MANAGEMENT** **9 Hours**

File System: File concept – Access methods – Directory structure – File system mounting – Protection. File-System Implementation : Directory implementation – Allocation methods – Free-space management – efficiency and performance – recovery. Case studies: File system in Linux – File system in Windows XP

Unit V **I/O SYSTEMS** **9 Hours**

I/O Systems – I/O Hardware – Application I/O interface – kernel I/O subsystem –streams – performance. Mass-Storage Structure: Disk scheduling – Disk management –Swap-space management – RAID – disk attachment – stable storage – tertiary storage. Case study: I/O in Linux.

Total: **45 Hours**

Further Reading:

Linux System, LINUX Multifunction Server, VMware on Linux Host and Adding Guest OS.

Course Outcomes:

Employability / Entrepreneurship

After completion of the course, Student will be able to

1. Understand Operating System Structure, Operations and Services& Illustrate the operating system concepts and its functionalities.
2. Understand the Process Concept, Multithreaded Programming, Process Scheduling and Synchronization
3. Apply the Concepts of Virtual Memory Management and File Systems
4. Analyze the Secondary Storage and I/O Systems
5. Evaluate the different Protection and Security Mechanisms for Operating System

References:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2012.

2.Andrew S. Tanenbaum, "Modern Operating Systems", Third Edition Prentice Hall of India Pvt. Ltd, 2010 (Case Study Topic).

3. Harvey M. Deitel, "Operating Systems", Pearson Education Pvt. Ltd, Second Edition, 2002.

4. William Stallings, "Operating System", Pearson Education, Sixth Edition, 2012.

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

E.G.S.PILLAYENGINEERINGCOLLEGE

(Autonomous)

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NAGAPATTINAM–611002

B.E. Electronics and Communication Engineering

Full Time Curriculum and Syllabus

Third Year– Sixth Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1701MGX01	Professional Ethics	2	0	0	2	40	60	100
1702EC601	VLSI Design	3	0	0	3	40	60	100
1702EC602	Digital Communication	3	0	0	3	40	60	100
1702EC603	Wireless Networks and Standards	3	0	0	3	40	60	100
1703EC814	Internet of Things (IoT)	3	0	0	3	40	60	100
	Professional(Open) Elective – IV	3	0	0	3	40	60	100
Laboratory Course								
1702EC651	VLSI Design Laboratory	0	0	2	1	50	50	100
1702EC652	Communication and Networks Laboratory	0	0	2	1	50	50	100
	Industrial Visits & Presentation	0	0	0	1	100	-	100
	Life Skills: Aptitude - II	0	0	2	1	100	-	100
	Total	**18**	**0**	**6**	**21**	**540**	**460**	**1000**
Professional (Open)Elective - III								
1703EC601	Information Theory and Coding	3	0	0	3	40	60	100
1703EC602	Digital Control Engineering	3	0	0	3	40	60	100

1703EC603	Network Security	3	0	0	3	40	60	100
1703EC604	Real Time Operating Systems	3	0	0	3	40	60	100
1703EC605	Soft Computing	3	0	0	3	40	60	100
Professional Elective – IV								
1703EC813	Cloud Computing	3	0	0	3	40	60	100
1703EC814	Internet of Things (IoT)	3	0	0	3	40	60	100
1703EC815	Big Data Analytics	3	0	0	3	40	60	100
1703EC816	Introduction to Web Technology	3	0	0	3	40	60	100
1703EC817	Grid Computing	3	0	0	3	40	60	100

L–Lecture|T–Tutorial|P–Practical|C–Credit|CA –ContinuousAssessment| ES–EndSemester

1701MGX01	PROFESSIONAL ETHICS	L	T	P	C
		3	0	0	3

Course Objectives:

1. To provide basic knowledge about engineering Ethics, Variety of moral issues and Moral dilemmas, Professional Ideals and Virtues
2. To provide basic familiarity about Engineers as responsible Experimenters, Research Ethics, Codes of Ethics, Industrial Standards, Exposure to Safety and Risk, Risk Benefit Analysis
3. To have an idea about the Collegiality and Loyalty, Collective Bargaining, Confidentiality, Occupational Crime, Professional, Employee, Intellectual Property Rights
4. To have an adequate knowledge about MNC's, Business, Environmental, Computer Ethics, Honesty, Moral Leadership, sample Code of Conduct.
5. To use the engineering principles to update and maintain the technical skills.

Unit I **I ENGINEERING ETHICS** **9 Hours**

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional Ideals and Virtues – Uses of Ethical Theories.

Unit II **II ENGINEERING AS SOCIAL EXPERIMENTATION** **9 Hours**

Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics - Codes of Ethics – Industrial Standards - A Balanced Outlook on Law – The Challenger Case Study.

Unit III **ENGINEER'S RESPONSIBILITY FOR SAFETY** **9 Hours**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis – Reducing Risk – The Government Regulator's Approach to Risk - Case Studies on Chernobyl, Bhopal MIC and Sterlite copper.

Unit IV **RESPONSIBILITIES AND RIGHTS** **9 Hours**

Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) - Discrimination.

Unit V	GLOBAL ISSUES	9 Hours
Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct.		
	Total:	**45 Hours**

Further Reading:

Case study on Hiroshima and Nagasaki

Course Outcomes:

Employability

After completion of the course, Student will be able to

1. Helps to examine situations and to internalize the need for applying Ethical principles, values to tackle with various situations.
2. Develop a responsible attitude towards Global issues
3. Envision the societal impact on the products/ projects
4. Understanding the code of ethics and standards
5. Apply ethics in society, discuss the global issues related to engineering and realize the responsibilities and rights in the society

References:

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, 1999.
2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, 2003
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, 2001.
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)

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

1702EC601	VLSI DESIGN	L	T	P	C
		3	0	0	3

Course Objectives:

1. To understand the CMOS Fabrication Process and CMOS Circuits
2. To study CMOS Circuits using various Logic Styles
3. To provide basic knowledge about Clocking, Memory and VLSI Subsystem Design

UNIT I	FABRICATION OF CMOS IC AND PHYSICAL DESIGN	9 Hours
An overview of Silicon Semiconductor technology- NMOS fabrication - CMOS fabrication: n-well, pwell- Twin tub and SOI Process- Layout design rules- Lambda Design Rules Stick Diagrams-VLSI Layout Design -Full Custom and Semi Custom Layout- Layout of Basic Structures - CMOS Logic Gates- Implementation of given logic function using CMOS logic-Basics of MEMS		
UNIT II	**MOS CIRCUIT DESIGN PROCESS**	**9 Hours**
Pass Transistor and Transmission Gate Static CMOS design, Tri-State Circuits- Pseudo Nmos –dynamic CMOS logic Clocked CMOS logic Precharged domino logic- Keeper Circuits - Dual Rail- Cascode Voltage Switch Logic-Circuit Pit Falls		
UNIT III	**CMOS LOGIC STYLES**	**9 Hours**
National and International standardizing organizations – FCC, CISPR, ANSI, DOD, IEC, CENEEC, FCC CE and RE standards – CISPR, CE and RE Standards, IEC/EN, CS standards – Frequency assignment – spectrum conversation.		
UNIT IV	**CMOS MEMORIES AND CLOCKING**	**9 Hours**

Conventional CMOS Latches CMOS D Flip Fop SDFF - TSPC Flip Flop - CMOS Static RAM Dual Port SRAM - SRAM Arrays - DRAM and Floating Gate MOSFET - Flash Memory CMOS Clocking Styles Pipelined Systems		
UNIT V	**VLSI SUBSYSTEM DESIGN**	**9 Hours**
CMOS Mux - Equality Detector - Shift and Rotation Operation - Parity generators- Ripple Carry Adder-Carry Look Ahead Adder -Carry Skip Adder - Carry select - Carry save-Array - Braun/ Baugh Wooley -Modified Booth Encoded Multiplier		
	Total:	**45 Hours**
Further Reading:	Comparison of Logic Styles - Differential and Sense Amplifier Circuits Prescaler - Bit Slice – ALU CMOS Clock Generation and Distributions - BICMOS- FINFET Technology	
Course Outcomes:		
	After completion of the course, Student will be able to	
	1. Demonstrate CMOS Fabrication process and Layout Design.	
	2. Analyze MOS Circuit Design Process.	
	3. Design the circuits using Various Logic Styles	
	4. Reveal the operation of CMOS Memory and Clocking Strategies	
	5. Design building block of VLSI system.	
References:		
1. John P.Uyemura, "Introduction to VLSI circuits and systems", John Wiley & Sons, 2015		
2. Neil.H.E Weste David Harris CMOS VLSI Design: A Circuits and Systems Perspective, 4th edition, Pearson Addison Wesley, 2015.		
3. Kamran Eshraghian, Douglas A. Pucknell, Essentials of VLSI Circuits and Systems Prentice Hall of India, 2015.		
4. E. Fabricious, Introduction to VLSI Design, 1st edition, McGraw Hill, 2014		
5. Keng,Lablebick,"CMOS Digital Integrated Circuits", Tata McGraw Hill, 2014		

17EC602	**DIGITAL COMMUNICATION**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Course Objectives:					
	1. To know the principles of amplitude modulation				
	2. To apply the concepts of Error control coding.				
	3. To understand the various Band pass signaling schemes.				
	4. To understand the principles of spread spectrum.				
UNIT I	**AMPLITUDE MODULATION**				**9 Hours**
Review of Fourier and Hilbert Transforms-Amplitude Modulation – AM, DSBSC, SSBSC, VSB– Spectral analysis of modulated signals–Demodulation – Square law, envelope detectors Super heterodyne receivers.					
UNIT II	**ERROR CONTROL CODING TECHNIQUES**				**9 Hours**
Channel coding theorem – Linear block codes – Hamming codes – Cyclic codes – Convolutional codes – Viterbi decoding.					
UNIT III	**INTRODUCTION AND INFORMATION THEORY**				**9 Hours**
Measure of information – Entropy – Source coding theorem – Discrete memory less channels– lossless, deterministic, noiseless, BEC, BSC – Mutual information – Channel capacity – Shannon Hartley law- Transform coding – LPC – Shannon-Fano coding, Huffman Coding, Run length coding, LZW algorithm.					
UNIT IV	**BANDPASS SIGNALING**				**9 Hours**
Comparison of base band and band pass signaling, Geometric representation of signals – ML detection - Correlator and matched filter detection- generation and detection of BPSK, BFSK, QPSK- BER and Power spectral Density Comparison- Structure of non-coherent receivers- generation and detection of					

BFSK, DPSK – Principles of QAM – Introduction to Band Pass Sampling theorem.		
UNIT V	**SYNCHRONISATION AND SPREAD SPECTRUM TECHNIQUES**	**9 Hours**
Importance of Synchronisation – Carrier, frame and symbol/Chip synchronization techniques, Spread Spectrum - PN Sequences, Direct Sequence and Frequency Hopping Spread Spectrum Systems, BER Analysis, Processing gain and Jamming Margin, Spread spectrum in Cellular Systems.		
	Total:	**45 Hours**
Further Reading:	Frequency of Spread Spectrum – TDMA – FDMA – CDMA – OFDMA.	

Employability / Entrepreneurship

Course Outcomes:

After completion of the course, Student will be able to

1. Design and implement the amplitude modulation
2. An ability to apply the concepts of Error control coding.
3. Capable of configuring Source coding schemes
4. Design and implement band pass signaling schemes.
5. Knowledge on the principle of spread spectrum.

References:

1. Simon Haykin, "Digital Communications", John Wiley, 2015.
2. J.G Proakis. —Digital Communication‖, 5/e, Tata Mc Graw Hill Company, 2008.
3. Bernard Sklar, "Digital Communication", 2nd Edition, Pearson Education, 2006.
4. Herbert Taub & Donald L Schilling , "Principles of Communication Systems", 3rd Edition, Tata McGraw Hill, 2008.
5. H P Hsu, Schaum Outline Series- —Analog and Digital Communications‖, TMH 2006 .

Dr. S. RAMABALAN M.E., Ph.D.
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

17EC603	WIRELESS NETWORKS AND STANDARDS	L	T	P	C
		3	0	0	3
	(Common to B.E / B.Tech – CSE, IT & ECE)				

Course Objectives:

1. To study about Wireless networks, protocol stack and standards.
2. To study about fundamentals of Access Techniques and Control Protocols
3. To study about Localization, Positioning and Wireless Security

Unit I	**Overview of Wireless Sensor Networks and Wireless Transmission**	**9 Hours**

Introduction of WSN, Basic Overview of the Technology, Range of Applications, Examples of WSN Applications, Frequencies for radio transmission, Signals, Antenna, Signal Propagation, Multiplexing, Modulation, Spread Spectrum

Unit II	**Multiple Access Techniques**	**9 Hours**

Introduction, Narrowband Channelized Systems, Spectral Efficiency, Wideband Systems, Comparisons of FDMA, TDMA, and DS-CDMA, Capacity of DS-CDMA System, Comparison of DS-CDMA vs. TDMA System Capacity, Frequency Hopping Spread Spectrum with M-ary frequency Shift Keying, Orthogonal Frequency Division Multiplexing (OFDM), Multicarrier DS-CDMA (MC-DS-CDMA), Random Access Methods, Idle Signal Casting Multiple Access, Packet Reservation Multiple Access, Error Control Schemes for Link Layer.

Unit III	**Routing and Transport Control Protocols for Wireless Sensor Networks**	**9 Hours**

Introduction, Data Dissemination and Gathering, Routing Challenges and Design Issues in Wireless Sensor Networks, Routing Strategies in Wireless Sensor Networks, Traditional Transport Control Protocols, Transport Protocol Design Issues, Examples of Existing Transport Control Protocols, Performance of Transport Control Protocols

Unit IV	**Localization and positioning**	**9 Hours**

Properties of localization and positioning procedures, Possible approaches, Mathematical basics for the lateration

problem, Single-hop localization, Positioning in multihop environments, Topology control - Motivation and basic ideas, Controlling topology in flat networks, Hierarchical networks by dominating sets, Hierarchical networks by clustering, Combining hierarchical topologies and power control, Adaptive node activity

Unit V	**Security in Wireless Systems and Wireless Application Protocol**	**9 Hours**

Security and Privacy Needs of a Wireless System, Required Features for a Secured Wireless Communications System, Methods of Providing Privacy and Security in Wireless Systems, Wireless Security and Standards, IEEE 802.11 Security, Security in North American Cellular/PCS Systems, Security in GSM, GPRS, and UMTS, Data Security, Air Interface Support for Authentication Methods, WAP Programming Model, WAP Architecture, WAP Advantages and Disadvantages, Applications of WAP, imode versus WAP

Total: 45 Hours

Further Reading:

1. Network Management and Operating Management for Wireless Sensor Networks
2. Performance and Traffic Management
3. Node and Network Architecture
4. Time synchronization, Naming and addressing

Course Outcomes:

Skill Development / Employability

After completion of the course, Student will be able to

1. Analyse the challenges and constraints of wireless sensor network and its subsystems
2. Examine the Multiple Access Techniques, Spread Spectrum and Multiplexing
3. Analyse the protocols used at the Routing and Transport Control
4. compare and analyse the types of Localization, positioning and topology techniques
5. Identify the application areas and practical implementation issues.

References:

1. Jochen Schiller, "Mobile Communications", Second Edition, Pearson Education 2012.
2. Vijay Garg, "Wireless Communications and networking", First Edition, Elsevier 2007.
3. Kazem Sohraby, "Wireless Sensor Networks Technology, Protocols and Applications", Wiley Interscience 2007.
4. Holger Karl, "Protocols and architectures for Wireless Sensor Networks", John Wiley & Sons 2005.

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

17EC651	**VLSI DESIGN LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**2**	**1**

Course Objectives:

1. To gain expertise in design, development and simulation of digital circuits with Verilog HDL.
2. To apply concepts and methods of digital system design techniques through hands-on experiments.
3. To develop skills, techniques and learn state-of-the-art engineering tools (such as HDL, Xilinx tools)

List of Experiments:

I. Design and simulation of Combinational Logic Circuit using Verilog HDL

1. Adder – Carry Select & Carry Save, Multiplexer and Demultiplexer, Encoder and Decoder
2. Multiplier

II. Design and simulation of Sequential Logic Circuit using Verilog HDL

3. Flip-flops, Counters, Shift Registers
4. Frequency Dividers

III. CMOS Circuit design using SPICE (DC and Transient Analysis)

5. CMOS Inverter

6. CMOS NAND and NOR Gates		
7. CMOS Latch		
IV. FPGA Implementation		
8. 4 bit Adder		
9. 4x4 Multiplier		
10. ALU Design		
	Total:	**45 Hours**

Additional Experiments:

1. Synchronous Sequential Logic circuits.
2. Asynchronous Sequential Logic circuits.

Course Outcomes:

Employability

After completion of the course, Student will be able to

1. Design and simulation of Combination Logic Circuit using Verilog HDL.
2. Design and simulation of Sequential Logic Circuit using Verilog HDL.
3. Design, Simulate and Extract the layouts of Analog IC Blocks using spice.
4. Analyze transient characteristics.
5. Import the logic modules into FPGA boards.

Dr. S. RAMABALAN, M.E., Ph.D.
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

1702EC652	COMMUNICATION AND NETWORKS LAB	L	T	P	C
		0	0	4	2
	(Common to B.E / B.Tech – CSE, IT & ECE)				

Course Objectives:

1. To make students aware about various types of cables used in guided media like coaxial cable, optical fiber cable, twisted pair cables and its categories
2. To understand the working difference between straight cable and cross over cable.
3. To use the packet tracer to simulate various networks.

List of Experiments:

1. Study of Network Topologies
2. Implementation And Study of Stop & Wait Protocol
3. Implementation And Study of Go Back N Protocol
4. Implementation And Study of Selective Repeat Protocol
5. Configure a Network Using Distance Vector Routing Protocol
6. Configure a Network Using Link State Vector Routing Protocol
7. Implementation And Study of CSMA/CA Protocol
8. Implementation of Data Encryption And Decryption
9. Configure a Network Topology Using Packet Tracer Software
10. To Create Scenario And Study The Performance of Network With CSMA/CD Protocols through Simulation

	Total:	**45 Hours**

Additional Experiments:

1. To Create Scenario And Study The Performance of Token Bus And Token Ring Protocols Through Simulation
2. Study of Socket Processing

Course Outcomes:

After completion of the course, Student will be able to

	1. To explain how communication works in computer networks and to understand the basic terminology of computer networks.
	2. To become familiar with the network simulator Packet Tracer.
	3. To be able to analyze different protocols used for packet communication like ALOHA Protocol.
	4. To understand the working of LAN Card, Hub, TELNET and to understand the working difference between straight cable and cross over cable.
	5. To explain the role of protocols in networking and to analyze the services and features of the various layers in the protocol stack.
References:	
1. Computer Networks: A Systems Approach, 4th Ed. (2007), by Larry Peterson and Bruce Davie. Covers background networking material with which students should have familiarity.	
2. Computer Networking: A Top-Down Approach Featuring the Internet, 5th Ed. (2010), by James F. Kurose and Keith W. Ross. Covers similar material to Peterson and Davie.	

		LIFE SKILLS: APTITUDE - II	**L**	**T**	**P**	**C**
			0	**0**	**2**	**1**
		B.E – ECE				
Course Objectives:						
	1. To brush up problem solving skill and to improve intellectual skill of the students					
	2. To be able to critically evaluate various real life situations by resorting to Analysis Of key issues and factors					
	3. To be able to demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.					
	4. To enhance analytical ability of students					
	5. To augment logical and critical thinking of Student					
Unit I	**Partnership, Mixtures and Allegations, Problem on Ages, Simple Interest, Compound Interest**					**5 Hours**
Introduction Partnership - Relation between capitals, Period of investments and Shares- Problems on mixtures - Allegation rule - Problems on Allegation – Problems on ages - Definitions Simple Interest - Problems on interest and amount - Problems when rate of interest and time period are numerically equal - Definition and formula for amount in compound interest - Difference between simple interest and compound interest for 2 years on the same principle and time period.						
Unit II	**Blood relations, , Clocks, Calendars**					**5 Hours**
Defining the various relations among the members of a family - Solving Blood Relation puzzles - Solving the problems on Blood Relations using symbols and notations - Finding the angle when the time is given - Finding the time when the angle is known - Relation between Angle, Minutes and Hours - Exceptional cases in clocks - Definition of a Leap Year - Finding the number of Odd days - Framing the year code for centuries - Finding the day of any random calendar date.						
Unit III	**Time and Distance, Time and Work**					**5 Hours**
Relation between speed, distance and time - Converting kmph into m/s and vice versa - Problems on average speed - Problems on relative speed - Problems on trains - Problems on boats and streams - Problems on circular tracks - Problems on races - Problems on Unitary method - Relation between Men, Days, Hours and Work - Problems on Man-Day-Hours method - Problems on alternate days - Problems on Pipes and Cisterns.						
Unit IV	**Data Interpretation and Data Sufficiency**					**5 Hours**
Problems on tabular form - Problems on Line Graphs - Problems on Bar Graphs - Problems on Pie Charts - Different models in Data Sufficiency - Problems on data redundancy						
Unit V	**Analytical and Critical Reasoning**					**5 Hours**
Problems on Linear arrangement - Problems on Circular arrangement - Problems on Double line-up - Problems on Selections - Problems on Comparisons - Finding the Implications for compound statements - Finding the Negations for compound statements - Problems on assumption - Problems on conclusions - Problems on inferences - Problems						

on strengthening and weakening of arguments .

	Total:	30 Hours

ASSESSMENT PATTERN :

1. Two tests will be conducted (25 * 2) - 50 marks
2. Five assignments will be conducted (5*10) - 50 Marks

Course Outcomes:

skill development

After completion of the course, Student will be able to

1. Solve problems on Partnership, Mixture & Allegation and ages least time using shortcuts and apply real life situations
2. Workout family relationships concepts, ability to visualize clocks & calendar and understand the logic behind a Sequence.
3. Calculate concepts of speed, time and distance, understand timely completion using time and work.
4. Learners should be able to understand various charts and interpreted data least time.
5. Workout puzzles, ability to arrange things in an orderly fashion.

References:

1. Arun Sharma, 'How to Prepare for Quantitative Aptitude for the CAT', 7th edition, McGraw Hills publication, 2016.
2. Arun Sharma, 'How to Prepare for Logical Reasoning for CAT', 4th edition, McGraw Hills publication, 2017.
3. R S Agarwal, 'A modern approach to Logical reasoning', revised edition, S.Chand publication, 2017.
4. R S Agarwal, 'Quantitative Aptitude for Competitive Examinations', revised edition, S.Chand publication, 2017.
5. Rajesh Verma, "Fast-Track Objective Arithmetic", 3rd edition, Arihant publication, 2018.
6. B.S. Sijwali and Indu Sijwali, "A New Approach to REASONING Verbal & Non-Verbal", 2nd edition, Arihnat publication, 2014.

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

Professional Elective – III

1703EC601	INFORMATION THEORY AND CODING	L	T	P	C
		3	0	0	3

Course Objectives:

1. To know basics of Information Theory
2. To understand noiseless channel capacity
3. To have a complete understanding of network information
4. To know about source codes and its limit performance

Unit I	INFORMATION THEORY	9 Hours

Introduction-Measure of information- Average information content of symbols in long independent sequences-Average information content of symbols in long dependent sequences -Entropy and information rate of mark-off source.

Unit II	CAPACITY OF NOISELESS CHANNEL	9 Hours

Fundamental theorem for a noiseless channel, Data compression, Kraft inequality, Shannon- Fano codes , Huffman codes , Asymptotic equipartition , Rate distortion theory.

Unit III	CHANNEL CAPACITY	9 Hours

Channel coding theorem-Differential entropy and mutual information for continuous ensembles-Channel

capacity Theorem. Binary Cycle Codes-Algebraic structures of cyclic codes		
Unit IV	**NETWORK INFORMATION THEORY**	**9 Hours**
Gaussian multiple user channels , Multiple access channel , Encoding of correlated sources, Relay channel , Source coding and rate distortion with side information , General multi-terminal networks		
Unit V	**SOURCE CODING AND FUNDAMENTAL LIMITS ON PERFORMANCE**	**9 Hours**
Encoding of the source output-Shannon's encoding algorithm-Communication Channels-Discrete communication channels -Source coding theorem-Huffman coding-Discrete memory less Channels-Mutual information-Channel Capacity		
	Total:	**45 Hours**

Further Reading:	
	1. Mark-off statistical model for information source
	2. Broadcast channel
	3. Continuous channels
Course Outcomes:	
	After completion of the course, Student will be able to
	1. illustrate the concept of Information theory
	2. understand of noiseless channel performance
	3. know different channel capacity techniques
	4. recognize basics of Information theory
	5. realize source coding and its limit affect performance

References:

1. Simon Haykin, Communication Systems, John Wiley & Sons. Pvt. Ltd, 2009
2. Elements of Information theory – Thomas Cover, Joy Thomas : Wiley 1999
3. Information Theory and Reliable Communication, R. G. Gallager, Wiley, 1966
4. David J.C. MacKay "Information theory, inference & learning algorithms" –Cambridge University Press *2003.*
5. Taub & Schilling, Principles of Communication Systems, Tata McGraw-Hill, 2007
6. Das, Mullick & Chatterjee, Principles of Digital Communication ,Wiley Eastern Ltd,2002
7. Information Theory, Inference, and Learning Algorithms, D. J. C. MacKay, Cambridge Univ. Press, 2003

1703EC602	DIGITAL CONTROL ENGINEERING	L	T	P	C
		3	0	0	3

Course Objectives:	
	1. Knowledge about principles of basic controllers
	2. Educate the students about stability analysis of digital control systems
	3. Train the students to develop digital control algorithms

Unit I	**PRINCIPLES OF CONTROLLERS**	**9 Hours**
Review of frequency and time response analysis and specifications of control systems, need for controllers, continues time compensations, continues time PI, PD, PID controllers, digital PID controllers		
Unit II	**SIGNAL PROCESSING IN DIGITAL CONTROL**	**9 Hours**
Sampling, time and frequency domain description, aliasing, hold operation, mathematical model of sample and hold, zero and first order hold, factors limiting the choice of sampling rate, reconstruction		
Unit III	**MODELING AND ANALYSIS OF SAMPLED DATA CONTROL SYSTEM**	**9 Hours**
Difference equation description, Z-transform method of description, pulse transfer function, time and frequency		

response of discrete time control systems, stability of digital control systems, Jury's stability test, state variable concepts, first companion, second companion, Jordan canonical models, discrete state variable models, elementary principles

Unit IV	DESIGN OF DIGITAL CONTROL ALGORITHMS	9 Hours

Review of principle of compensator design, Z-plane specifications, digital compensator design using frequency response plots, discrete integrator, discrete differentiator, development of digital PID controller, transfer function, design in the Z-plane

Unit V	PRACTICAL ASPECTS OF DIGITAL CONTROL ALGORITHMS	9 Hours

Algorithm development of PID control algorithms, software implementation, implementation using microprocessors and microcontrollers, finite word length effects, choice of data acquisition systems, microcontroller based temperature control systems, microcontroller based motor speed control systems

	Total:	45 Hours

Further Reading:

Digital Control Engineering in Power electronics

Employability/Entrepreneurship

Course Outcomes:

After completion of the course, Student will be able to

1. Understand the basics of different controllers used in digital control Engineering
2. Analyze signals in both time domain and Z domain
3. Understand the basic knowledge necessary for sampled data control system
4. Understand the state variable technique
5. Develop the algorithm for digital control systems

References:

1. M.Gopal, "Digital Control and Static Variable Methods", Tata McGraw Hill, New Delhi, 1997.
2. John J. D'Azzo, "Constantine Houpios, Linear Control System Analysis and Design", Mc Graw Hill, 1995
3. Kenneth J. Ayala, "The 8051 Microcontroller- Architecture, Programming and applications", Penram International, 2nd Edition, 1996

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

1703EC603	NETWORK SECURITY	L	T	P	C
		3	0	0	3
	(Common to B.E / B.Tech – CSE, IT& ECE)				

Course Objectives:

1. To gain knowledge on the various attacks in a network
2. To acquire knowledge on various encryption standards.
3. To build the ability to develop security standard based on the requirement

Unit I	INTRODUCTION	8 Hours

Security Threats, Security Attacks, Security Services, Mechanisms- Model for Network Security- Classical Encryption Techniques- Substitutions-Transpositions Techniques- Stream Cipher, Block Cipher-Block Cipher Modes-ECB-CBC-CFB-OFB

Unit II	BLOCK CIPHERS AND THE DATA ENCRYPTION STANDARD	8 Hours

Simple DES-Differential cryptanalysis- DES-Modes of operation-Triple DES-AES-RC4 –RSA.

Unit III	HASH ALGORITHM, KEY MANAGEMENT	9 Hours

Hash Function-Message Digest algorithm (MD 5)- Secure Hash Algorithm- Diffie-Hellman Key Exchange- Key Management Techniques- Key Distribution- Key Agreement - Elliptic Curve Cryptography - Digital Signatures-Authentication Protocols

Unit IV	SECURITY PRACTICE & SYSTEM SECURITY	9 Hours

Authentication applications – Kerberos – X.509 Authentication services - Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls - Firewall designs - SET for E-Commerce Transactions. Intruder – Intrusion detection system – Virus and related threats – Countermeasures – Firewalls design principles – Trusted systems – Practical implementation of cryptography and security.

Unit V	E-MAIL, IP & WEB SECURITY	11 Hours

E-mail Security: Security Services for E-mail-attacks possible through E-mail - establishing keys privacy-authentication of the source-Message Integrity-Non-repudiation-Pretty Good Privacy-S/MIME. IPSecurity: Overview of IPSec - IP and IPv6-Authentication Header-Encapsulation Security Payload (ESP)-Internet Key Exchange (Phases of IKE, ISAKMP/IKE Encoding). Web Security: SSL/TLS Basic Protocol-computing the keys- client authentication-PKI as deployed by SSLAttacks fixed in v3- Exportability-Encoding-Secure Electronic Transaction (SET).		
	Total:	**45 Hours**
Further Reading:		
	1. Attacks- Primarily test- factoring, Discrete Logarithms	
	2. Malicious software-viruses-Firewalls- Security Standards.	
Course Outcomes		
	After completion of the course. Student will be able to	
	1. Identify vulnerability of computer networks to security threats.	
	2. Acquire knowledge on existing security algorithms and cryptography standards.	
	3. Understand various cryptography techniques and their implications on network security	
	4. Analyze the type of security threat and the appropriate security standard to be adopted	
	5. Formulate and implement new security standards	
References:		
1. William Stallings."Cryptography and Network Security: Principles and Practice",Prentice Hall Professional Technical Reference, Fourth Edition. 2004		
2. Alfred J. Menezes, Paul C.VanOorSchot, Scott A.Van Stone, "Handbook Of Applied Cryptography", CRC Press, 1996.		
3. Atul Kahate "Cryptography and Network Security". Tata McGraw-Hill		
4. Bruce Schneier,"Applied Cryptography: Protocols, Algorithms, and Source Code in C",Second Edition, Wiley, John & Sons, Incorporated, October 1995.		
5. Richard E. Smith,"Internet Cryptography", Addison- Wesley, 1997		

1703EC604	**REAL TIME OPERATING SYSTEM**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
	(Common to B.E / B.Tech – CSE, IT & ECE)				
Course Objectives:	Gain knowledge in the following:				
	1. To importance of deadlines and concept of task scheduling.				
	2. Student will be able to understand and design real time operating systems which are backbone of embedded industry.				
Unit I	**INTRODUCTION TO REAL TIME SYSTEMS**				**8 Hours**
Issues in real time computing Structure of real time system Need for RTOS Task classes Performance measures for real time system: Properties, traditional performance measures, perform ability, cost functions and hard deadlines, and Estimating program run times. Introduction LINUX/ UNIX OS.					
Unit II	**FEATURES OF REAL TIME OPERATING SYSTEM**				**9 Hours**
Messages queues mailboxes pipes timer function events memory management Interrupt basic system design using an RT (OS design principles. interrupt routines. task structures and priority.) Current research in RTOS. Case Studies: Vx Works and Micro OS-II.					
Unit III	**EMBEDDED SYSTEMS, PROCESSOR**				**9 Hours**
Embedded into a system, Hareware units and devices in a system, software, Examples, SoC and VLSI technology, Complex System design and processors, System Design process,					
Unit IV	**UNIT-IV: PROCESSES AND REAL-TIME OPERATING SYSTEMS**				**8 Hours**
Threads and Tasks, Tasks, Task States, Task and Data, Concept of Semaphores, Shared Data, Inter-process Communication, Signal Function, Semaphore Functions, Message Queue Functions, Mailbox Functions, Pipe Functions. Real-Time Operating Systems: OS Services, Process Management, Timer Functions, Event Functions, Memory Management, Device, File and I/O subsystems management, Interrupt routines.					
Unit V	**EMBEDDED SYSTEM DEVELOPMENT**				**11 Hours**

Embedded Software Development Process and Testing: Introduction to Embedded Software Development Process and Tools, Host and Target Machines, Linking and Locating Software, Getting Embedded Software into the Target System, Issues in Hardware-Software Design and Co-design, Testing on Host Machine, Simulators and Laboratory Tools.

Total: 45 Hours

Further Reading:

Basics of operating system; Basics of Embedded system

Course Outcomes:

After completion of the course, Student will be able to

Employability / Entrepreneurship

1. Understand the basics of RTOS and LINUX
2. Handle the RTOS mail boxes, time functions
3. Know the Embedded system design process.
4. Operate the RTOS systems and functions.
5. Understand the Embedded software testing and development

REFERENCE BOOKS:

1. An Embedded Software Primer, David E. Simon Pearson Education Asia Publication ISBN-13
2. Real Time Systems, C.M. Krishna and Kang G. Shin, TMH Publication ISBN 13:
3. Embedded system: Architecture Programming and Design, Raj Kamal, TMH Publication SBN 13

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt.) Tamil Nadu.

17CS208	SOFT COMPUTING	L	T	P	C
		3	0	0	3
	(Common to B.E / B.Tech. ECE, CSE & IT)				

Course Objectives:

1. Learn the various soft computing frame works.
2. Be familiar with design of various neural networks.
3. Be exposed to fuzzy logic.
4. Learn genetic programming.

Unit I INTRODUCTION **9 Hours**

Artificial neural network: Introduction, characteristics- learning methods – taxonomy – Evolution of neural networks- basic models - important technologies - applications. Fuzzy logic: Introduction - crisp sets- fuzzy sets - crisp relations and fuzzy relations: cartesian product of relation - classical relation, fuzzy relations, tolerance and equivalence relations, non-iterative fuzzy sets. Genetic algorithm- Introduction - biological background - traditional optimization and search techniques - Genetic basic concepts.

Unit II NEURAL NETWORKS **9 Hours**

McCulloch-Pitts neuron - linear separability - hebb network - supervised learning network: perceptron networks - adaptive linear neuron, multiple adaptive linear neuron, BPN, RBF, TDNN- associative memory network: auto-associative memory network, hetero-associative memory network, BAM, hopfield networks, iterative autoassociative memory network & iterative associative memory network – unsupervised learning networks: Kohonenself organizing feature maps, LVQ – CP networks, ART network.

Unit III FUZZY LOGIC **9 Hours**

Membership functions: features, fuzzification, methods of membership value assignments-Defuzzification: lambda cuts - methods - fuzzy arithmetic and fuzzy measures: fuzzy arithmetic -extension principle - fuzzy measures - measures of fuzziness -fuzzy integrals - fuzzy rule base and approximate reasoning : truth values and tables, fuzzy propositions, formation of rules-decomposition of rules, aggregation of fuzzy rules, fuzzy reasoning-fuzzy inference systems-overview of fuzzy expert system-fuzzy decision making.

Unit IV GENETIC ALGORITHM **9 Hours**

Genetic algorithm and search space - general genetic algorithm – operators - Generational cycle - stopping condition – constraints - classification - genetic programming – multilevel optimization – real life problem- advances in GA

Unit V HYBRID SOFT COMPUTING TECHNIQUES & APPLICATIONS **9 Hours**

Neuro-fuzzy hybrid systems - genetic neuro hybrid systems - genetic fuzzy hybrid and fuzzy genetic hybrid systems - simplified fuzzy ARTMAP - Applications: A fusion approach of multispectral images with SAR, optimization of traveling salesman problem using genetic algorithm approach, soft computing based hybrid fuzzy controllers

Total: 45 Hours

Further Reading:

	1. Reinforcement learning
	2. Applications of neuro fuzzy system
Course Outcomes:	
	After completion of the course, Student will be able to
	1. Apply various soft computing frame works.
	2. Design of various neural networks.
	3. Use fuzzy logic.
	4. Apply genetic programming.
	5. Discuss hybrid soft computing
References:	
1.	J.S.R.Jang, C.T. Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI / Pearson Education 2004.
2.	S.N.Sivanandam and S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt Ltd, 2011.
3.	S.Rajasekaran and G.A.VijayalakshmiPai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis & Applications", Prentice Hall of India Pvt. Ltd., 2006.
4.	David E. Goldberg, "Genetic Algorithm in Search Optimization and Machine Learning" Pearson Education India, 2013.
5.	George J. Klir, Ute St. Clair, Bo Yuan, "Fuzzy Set Theory: Foundations and Applications" Prentice Hall, 1997.

PROFESSIONAL (OPEN) ELECTIVES – IV

17IT703		**CLOUD COMPUTING**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**
		(Common to B.E / B.Tech – CSE, IT & ECE)				
Course Objectives:						
	1. To understand the differences between traditional deployment and cloud computing					
	2. To determine whether existing applications to the cloud makes technical and business sense					
	3. To learn how to build a transactional web application for the cloud or migrate one to it					
Unit I	**Cloud Architecture Basics**					**9 Hours**
The Cloud -Hype cycle-metaphorical interpretation-cloud architecture standards and interoperability- Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public, private clouds community cloud, role of virtualization in enabling the cloud.						
Unit II	**End to End Design**					**9 Hours**
Requirement analysis: strategic alignment and architecture development cycle-strategic impact-Risk impact-financial impact-Business criteria-technical criteria-cloud opportunities –evaluation criteria and weight-End to end design-content delivery networks-capacity planning-security architecture and design.						
Unit III	**Cloud Application Architectures**					**9 Hours**
Development environments for service development; Amazon, Azure, Google App-cloud platform in industry						
Unit IV	**How to Move Application into the Cloud**					**9 Hours**
Web Application Design- Machine Image Design-privacy design –Database management						
Unit V	**Specialized Cloud Architecture**					**9 Hours**
Workload distribution architecture-Dynamic scalability-Cloud bursting-hypervisor clustering-service quality metrics &SLA.						
		Total:				**45 Hours**
Further Reading:						
	1. Docker and Containers					
	2. Server less computing					
Course Outcomes:						
	After completion of the course, Student will be able to					
	1. Understand the differences between traditional and Cloud deployment					
	2. Understand technical and business viability of migrating existing applications to cloud					
	3. Deploy cloud applications on AWS and Azure					
	4. Design and build cloud based applications					

	5. Design scalable cloud environment for elastic demands
References:	
1.	John Rhoton ,Cloud Computing Explained: Handbook for Enterprise Implementation 2013 edition, 2013, recursive press
2.	RajkumarBuyya, Christian Vecchiola, S.ThamaraiSelvi,Mastering Cloud Computing: Foundations and Applications Programming,MorganKaufmann,,Elsevier publication, 2013
3.	Thomas Erl, ZaighamMahmood, and Ricardo Puttini,Cloud Computing Concepts, Technology & Architecture, PRENTICE HALL,2013
4.	Reese, G (2009). Cloud Application Architectures: Building Applications and Infrastructure in the Cloud. Sebastopol, CA: O'Reilly Media, Inc. (2009).

17CS033	INTERNET OF THINGS	L	T	P	C
		3	0	0	3
	(Common to B.E / B.Tech – CSE, IT & ECE)				
Course Objectives:					
	1. To understand the concepts of Internet of Things				
	2. To introduce network and communication protocols of IoT				
	3. To build IoT applications.				
Unit I	**Introduction to IoT**				**9 Hours**
Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs, Machine to Machine, Difference between IoT and M2M, Software defined Network(SDN)					
Unit II	**Network and Communication Aspects**				**9 Hours**
Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination					
Unit III	**Challenges of IoT**				**9 Hours**
Design challenges, Development challenges, Security challenges, Other challenges					
Unit IV	**Applications of IoT**				**9 Hours**
Home automation, Industry applications, Surveillance applications, Other IoT applications					
Unit V	**Developing IoTs**				**9 Hours**
Introduction to Python, Introduction to different IoT tools, Developing applications through IoT tools, Developing sensor based application through embedded system platform, Implementing IoT concepts with python					
	Total:				**45 Hours**
Further Reading:					
	1. Cloud Computing				
	2. Dockers and Containers				
Course Outcomes:					
	After completion of the course, Student will be able to				
	1. Understand the concepts of Internet of Things				
	2. Analyze basic protocols in wireless sensor network				
	3. Design IoT applications in different domain and be able to analyze their performance				
	4. Implement basic IoT applications on embedded platform				
	5. Develop the coding using Python programming.				
References:					
1. Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach"					
2. Waltenegus Dargie,Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"					

1703EC815	BIG DATA ANALYTICS	L	T	P	C
		3	0	0	3
	(Common to B.E / B.Tech – CSE& IT)				
Course Objectives:					
	1. Be exposed to big data				

	2. Learn the different ways of Data Analysis
	3. Learn the mining and clustering
	4. Be familiar with the data streams and visualization

Unit I	INTRODUCTION TO BIG DATA	9 Hours
Introduction to Big Data Platform – Challenges of conventional systems - Web data – Evolution of Analytic scalability, analytic processes and tools, Analysis vs reporting - Modern data analytic tools, Stastical concepts: Sampling distributions, resampling, statistical inference, prediction error.		
Unit II	DATA ANALYSIS	**9 Hours**
Regression modeling, Multivariate analysis, Bayesian modeling, inference and Bayesian networks, Support vector and kernel methods, Analysis of time series: linear systems analysis, nonlinear dynamics - Rule induction - Neural networks: learning and generalization, competitive learning, principal component analysis and neural networks; Fuzzy logic: extracting fuzzy model's from data, fuzzy decision trees, Stochastic search methods.		
Unit III	MINING DATA STREAMS	**9 Hours**
Introduction to Stream Concepts – Stream data model and architecture - Stream Computing,Sampling data in a stream – Filtering streams – Counting distinct elements in a stream – Estimating moments – Counting oneness in a window – Decaying window – Realtime Analytics Platform(RTAP) applications - case studies - real time sentiment analysis, stock market predictions.		
Unit IV	FREQUENT ITEMSETS AND CLUSTERING	**9 Hours**
Mining Frequent itemsets - Market based model – Apriori Algorithm – Handling large data sets in Main memory – Limited Pass algorithm – Counting frequent itemsets in a stream – Clustering Techniques – Hierarchical – K- Means – Clustering high dimensional data – CLIQUE and PROCLUS – Frequent pattern based clustering methods – Clustering in non-euclidean space – Clustering for streams and Parallelism.		
Unit V	FRAMEWORKS AND VISUALIZATION	**9 Hours**
MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases - S3 - Hadoop Distributed file systems – Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications		
	Total:	**45 Hours**

Further Reading:

1. Analyzing big data with twitter
2. Big data for Ecommerce and Big data for blogs

Course Outcomes:

After completion of the course, Student will be able to

1. Apply the statistical analysis methods.
2. Compare and contrast various soft computing frameworks
3. Design distributed file systems
4. Apply Stream data model.
5. Use visualization techniques

References:

1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007.
2. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press, 2012.
3. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced analytics, John Wiley & sons, 2012.
4. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O'Reilly, 2011.

1702CS601	INTRODUCTION TO WEB TECHNOLOGY	L	T	P	C
		3	0	0	3

Course Objectives:

1. To impart the new concepts in Web Technologies
2. To develop understanding about the different technologies used in the World Wide Web including XML, Perl, Rails and PHP

Unit I	INTRODUCTION	9 Hours

XHTML Evolution of HTML and XHTML- Standard XHTML Document Structure- Basic Text Markup- Images-Hypertext Links-Lists- Tables- Forms- Frames. Cascading Style Sheets Introduction to CSS – Levels of Style Sheets- Style Specification Formats- Selector Forms- Property Value Forms – Font Properties- List Properties – Color- Alignment of Text – Background Images- Span and Div Tags.		
Unit II	XML	**9Hours**
Introduction to SGML – features of XML - XML as a subset of SGML – XML Vs HTML – Views of an XML document - Syntax of XML - XML Document Structure – Namespaces- XML Schemas- simple XML documents – Different forms of markup that can occur in XML documents - Document Type declarations – Creating XML DTDs – Displaying XML Data in HTML browser – Converting XML to HTML with XSL minimalist XSL style sheets – XML applications		
Unit III	PERL	**9 Hours**
Origin and Use of Perl- Scalars and their Operations – Assignment Statements and Simple Input and Output – Control Statements- Fundamentals of Arrays – Hashes References- Functions- Pattern Matching – File Input and Output – Simple programs in Perl -Using Perl for CGI Programming.		
Unit IV	PHP & MySQL	**9 Hours**
Origin and Use of PHP- Overview of PHP- General Syntactic Characteristics Operations and Expressions- Control Statements- Arrays- Functions-Pattern Matching- Form Handling- Files-Cookies-Session Tracking - Database Connectivity- Simple programs in PHP and MySQL.		
Unit V	RAILS & AJAX	**9 Hours**
RAILS – Overview of Rails- Document Requests- Processing Forms- Rails Application with Databases – Layouts AJAX – Ajax Overview of Ajax – Basics of Ajax – Rails with Ajax.		
	Total:	**45 Hours**

Further Reading: Data analytics & Severless Computing

Course Outcomes:

After completion of the course, Students will be able to

1. Develop web pages using basic HTML
2. Apply XML techniques in web design
3. Implement CGI using Perl
4. Implement PHP & MySQL database connectivity for real world applications
5. Use AJAX with Rails.

References:

1. DeitelDeitel, Nieto, Lin, Sadhu, XML How to Program, Pearson Education ,New Delhi, 2011
2. Kogent Learning Solutions Inc. Web Technologies Black Book, Dreamtech Press, New Delhi, 2009
3. Chris Bates, Web Programming Building Internet Applications 3rd ed., Wiley India Edition, New Delhi, 2009
4. Phil Ballard, Michael Moncur, Sams Teach Yourself Ajax, JavaScript and PHP, Pearson Education ,New Delhi, 2009
5. Achyut S Godbole , Atul Kahate, Web Technologies TCP/IP Architecture and Java Programming, 2nd ed., Tata McGraw Hill Education Private Limited, New Delhi, 2010
6. Pankaj Sharma, Introduction to Web Technology, Katson Books, New Delhi, 2008
7. Bankim Patel, Lal Pihari Barik, Introduction to Web Technology & Internet, Acme Learning Private Limited, New Delhi, 2009

	GRID COMPUTING	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
	(B.E / B.Tech – ECE)				

Course Objectives:

1. To introduce the underlying concepts and architecture of Grid Computing
2. To understand the grid security and management
3. To introduce various grid middlewares

Unit I	**Concepts And Architecture** **9 Hours**
Introduction-Parallel and Distributed Computing-Cluster Computing-Grid Computing- Anatomy and	

Physiology of Grid-Review of Web Services-OGSA-WSRF		
Unit II	**Grid Monitoring**	**9 Hours**
Grid Monitoring Architecture (GMA) - An Overview of Grid Monitoring Systems- GridICE – JAMM -MDS-Network Weather Service-R-GMA-Other Monitoring Systems- Ganglia and GridMon		
Unit III	**Grid Security And Resource Management**	**9 Hours**
Grid Security-A Brief Security Primer-PKI-X509 Certificates-Grid Security-Grid Scheduling and Resource Management-Scheduling Paradigms- Working principles of Scheduling -A Review of Condor, SGE, PBS and LSF-Grid Scheduling with QoS		
Unit IV	**Data Management And Grid Portals**	**9 Hours**
Data Management-Categories and Origins of Structured Data-Data Management Challenges-Architectural Approaches-Collective Data Management Services-Federation Services-Grid Portals-First-Generation Grid Portals-Second-Generation Grid Portals.		
Unit V	**Grid Middleware**	**9 Hours**
List of globally available Middlewares - Case Studies-Recent version of Globus Toolkit and gLite - Architecture, Components and Features.		
	Total:	**45 Hours**

Course Outcomes:	
After completion of the course, Student will be able to	
1.	Understand the concepts of Grid Architecture
2.	Understand the resource and data management of grid
3.	Analyze the security requirements of grid
4.	Utilize the data management and grid portals
5	Use the grid middlewares like globus toolkit

References:

1.Maozhen Li, Mark Baker, The Grid Core Technologies, John Wiley & Sons ,2005.

2.Ian Foster & Carl Kesselman. The Grid 2 – Blueprint for a New Computing Infrastructure , Morgan Kaufman – 2004.

3.Joshy Joseph & Craig Fellenstein, "Grid Computing", Pearson Education 2004.

4.Fran Berman, Geoffrey Fox, Anthony J.G. Hey, "Grid Computing: Making the Global Infrastructure a reality", John Wiley and sons, 2006.

E.G.S. PILLAY ENGINEERINGCOLLEGE

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NAGAPATTINAM–611002

B.E.Electronics and Communication Engineering

Full Time Curriculum and Syllabus

Final Year– Seventh Semester

Course Code	CourseName	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1702EC701	Microwave Engineering	2	0	0	2	40	60	100
1702EC702	Optical Communication	3	0	0	3	40	60	100
1702EC703	Wireless Communication	3	0	0	3	40	60	100
1702EC704	Image Processing	3	0	0	3	40	60	100
	Professional (Open)Elective – V	3	0	0	3	40	60	100
	Professional Elective – VI	3	0	0	3	40	60	100
LaboratoryCourse								
1702EC751	Microwave and Optical Communication Laboratory	0	0	2	1	50	50	100
1702EC752	Mini Project	0	0	0	1	100	-	100
1704EC753	In-plant Training/ Internship Presentation	0	0	0	1	100	-	100
1704GE751	Life Skills: Competitive Exams Preparation	2	0	0	2	100	-	100
	Total	**20**	**0**	**6**	**24**	**640**	**460**	**1100**
Professional Elective - V								
1703MG701	Principles of Management	3	0	0	3	40	60	100
1703MG702	Disaster Management	3	0	0	3	40	60	100
1703MG703	Total Quality Management	3	0	0	3	40	60	100

. 1703MG704	Industrial Economics	3	0	0	3	40	60	100

1702EC701	MICROWAVE ENGINEERING	L	T	P	C
		3	0	0	3

Course Objectives:

1. To gain knowledge about RF Electronics.
2. To study about the various microwave component, signal generators and amplifiers.
3. To gain knowledge about integrated circuits and microwave meaurements.

Unit I **INTRODUCTION TO RF ELECTRONICS** **9 Hours**

The Electromagnetic Spectrum, units and Physical Constants, Microwave bands, RF behavior of Passive components: Tuned resonant circuits, Vectors, Inductors and Capacitors. Voltage and Current in capacitor circuits, Tuned RF/IF Transformers.

Unit II **MICROWAVE COMPONENTS** **9 Hours**

Introduction to Microwaves and their applications, Coaxial Line Components, Wave-guide Components, Directional Couplers, Hybrid Tee Junction, Magic Tee, Attenuators, Ferrite Devices, Isolators, Circulators, Cavity Resonators, Re-entrant Cavities, Wave-meters, Microwave Filters, Detectors, Mixers.

Unit III **MICROWAVE SIGNAL GENERATORS AND AMPLIFIERS** **9 Hours**

Vacuum Tube Triodes, Resonant Cavity Devices, Reflex Klystron, Two –Cavity Klystron, Multi – Cavity Klystron, Slow – Wave Devices, TWT, Crossed Field Devices, Magnetrons, Semiconductor Devices, Microwave BJTs, FETs, Tunnel Diodes, Gunn Diode, IMPATT, TRAPATT Diodes.

Unit IV **MICROWAVE INTEGRATED CIRCUITS** **9 Hours**

Materials, Substrate, Conductor, Dielectric and Resistive Materials, MMIC Growth, Fabrication Techniques, MOSFET Fabrication, NMOS Growth and CMOS Development, Thin Film Formation.

Unit V **MICROWAVE MEASUREMENTS** **9 Hours**

VSWR, Frequency, Guide Wavelength, Coupling and Directivity measurements

Total: 45 Hours

Further Reading:

1. Recent trend in Microwave application.

Course Outcomes:

Employability

After completion of the course, Student will be able to

1. Explain about RF Electronics.
2. Identify the component for microwave application.
3. Discuss signal generator and amplifiers.
4. Illustrate the concept of microwave integrated circuits.
5. Explain about microwave measurements.

References:

1703MG705	Foundation Skills in Integrated Product Development	3	0	0	3	40	60	100

Professional Elective – VI

1703EC021	Advanced Digital Signal Processing	3	0	0	3	40	60	100
1703EC022	Embedded System	3	0	0	3	40	60	100
1703EC023	Pattern Recognition and Machine Learning	3	0	0	3	40	60	100
1703EC024	Speech Processing	3	0	0	3	40	60	100
1703EC025	VLSI Signal Processing	3	0	0	3	40	60	100
1703EC026	RF System Design	3	0	0	3	40	60	100

L–Lecture|T–Tutorial|P–Practical|C–Credit|CA –ContinuousAssessment| ES–EndSemester

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

1. Reinhold Ludwing, Pavel Bretchko, "RF Circuit design: Theory and applications", Pearson Education Asia Publication, New Delhi 2001.
2.Foundations For Microwave Engineering, R. R. Collin, McGraw Hill
3.Microwave Communications – Components and Circuits, E. Hund, McGrawHill.
4.Microwave Devices and Circuits, S. Y. Liao, PHI.
5.Microwave Engineering, R. Chatarjee, East – West Press Pvt. Ltd.

1702EC702	OPTICAL COMMUNICATION	L	T	P	C
		3	0	0	3

Course Objectives:

1. To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures
2. To understand the different kind of losses, signal distortion in optical wave guides and other signal degradation factors. Design optimization of SM fibers, RI profile and cut-off wave length.
3. To learn about various Optical Sources and Detectors.
4. To Explore the trends of optical fiber measurement systems.
5. To Enrich the idea of optical fiber networks algorithm such as SONET/SDH and optical CDMA

Unit I INTRODUCTION TO OPTICAL FIBERS **9 Hours**

Evolution of fiber optic system- Element of an Optical Fiber Transmission link Ray theory transmission- Total internal reflection-Acceptance angle--Numerical aperture – Skew rays – Electromagnetic mode theory of optical propagation –EM waves – modes in Planar guide – phase and group velocity – cylindrical fibers –SM fibers- Graded Index fiber structure

Unit II SIGNAL DEGRADATION OPTICAL FIBERS **9 Hours**

Attenuation - Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Wave guides-Information Capacity determination -Group Delay-Material Dispersion, Wave guide Dispersion, Signal distortion in SM fibers-Polarization Mode dispersion, Intermodal dispersion- Pulse Broadening in GI fibers-Mode Coupling -Optical fiber connectors, Fiber alignment and Joint Losses – Fiber Splices – Fiber connectors – Expanded Beam Connectors – Fiber Couplers

Unit III SOURCES AND DETECTORS **9 Hours**

Optical sources: Light Emitting Diodes - LED structures - surface and edge emitters, mono and hetero structures - internal - quantum efficiency, lasers Diode Modes and Threshold condition -Rate equations -External Quantum efficiency -Resonant frequencies- injection laser diode structures.

Optical Detectors: PIN Photo detectors, Avalanche photo diodes, construction, characteristics and properties, Comparison of performance, Photo detector noise –Noise sources, Signal to Noise ratio , Detector response time.

Unit IV FIBER OPTIC RECEIVER AND MEASUREMENTS **9 Hours**

Fundamental receiver operation, Pre amplifiers, Error sources – Receiver Configuration– Probability of Error – Quantum limit, Fiber Attenuation measurements- Dispersion measurements – Fiber Refractive index profile measurements – Fiber cut- off Wave length Measurements – Fiber Numerical Aperture Measurements – Fiber diameter measurements

Unit V OPTICAL NETWORKS AND SYSTEM TRANSMISSION **9 Hours**

Basic Networks – SONET / SDH – Broadcast – and –select WDM Networks – Wavelength Routed Networks – Non linear effects on Network performance – Link Power budget -Rise time budget- Noise Effects on System Performance-Operational Principles of WDM Performance of WDM + EDFA system – Solitons – Optical CDMA – Ultra High Capacity Networks.

Total: 45 Hours

Further Reading:	
	1. Design Optimization of SM fibers-RI profile and cut-off wavelength.
	2. Fiber amplifiers- Power Launching and coupling, Lencing schemes
Course Outcomes:	
	After completion of the course, Student will be able to
	1. Discuss the various optical fiber modes, configurations.
	2. Demonstrate various signal degradation factors associated with optical fiber.
	3. Classify various optical sources and optical detectors and their use in the optical communication system.
	4. Explain Various Fiber Optic measurements.
	5. Calculate the digital transmission and its associated parameters on system performance.
References:	
1. Gerd Keiser, "Optical Fiber Communication" Mc Graw -Hill International, 4th Edition., 2010.	
2. John M. Senior , "Optical Fiber Communication", Second Edition, Pearson Education, 2007.	
3. Ramaswami, Sivarajan and Sasaki "Optical Networks", Morgan Kaufmann, 2009	
4. J.Senior, "Optical Communication, Principles and Practice", Prentice Hall of India, 2008.	
5. J.Gower, "Optical Communication System", Prentice Hall of India, 2001.	

Entrepreneurship

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

1702EC703	WIRELESS COMMUNICATIONS	L	T	P	C
		3	0	0	3
	(Common to B.E / B.Tech – ECE, IT)				

Course Objectives:	
	1. To become skilled at fundamentals of mobile and wireless communication technologies and its applications.
	2. To create the student to work on the transceivers for wireless channels.

Unit I	**Introduction**	**4 Hours**
Introduction to wireless Communication systems – Evolution of Mobile communication system – 2G, 3G, 4G, UMTS, LTE, WLL, WLAN, WPAN, Bluetooth, Ultra Wide Band		
Unit II	**Mobile Radio Propagation**	**10 Hours**
Large scale path loss –Path loss models: Free Space and TwoRay models -Link Budget design –Small scale fading- Parameters of mobile multipath channels –Time dispersion parameters-Coherence bandwidth –Doppler spread & Coherence time, Fading due to Multipath time delayspread--flat fading frequency selective fading –Fading due to Doppler spread --fast fading –slow fading.		
Unit III	**Cellular Communication**	**10 Hours**
Introduction, Frequency reuse, Cell Assignment techniques, Hand off Strategies, Interference and System Capacity, Trunking and Grade of Service, Improving Coverage and capacity in cellular systems.Multiple Access techniques: FDMA, TDMA, CDMA, SDMA		
Unit IV	**Modulation Schemes and Spread Spectrum**	**12 Hours**
Modulation techniques: M-QAM, M-PSK, GMSK, Spread Spectrum Systems: PN sequence-m-sequence -Direct Sequence Spread Spectrum -Frequency Hopping Spread Spectrum, Synchronization techniques for Spread Spectrum signals, Diversity and Combining Techniques: Time Diversity, Frequency diversity, Space Diversity		
Unit V	**Multiple Antenna Techniques**	**9 Hours**
MIMO systems – spatial multiplexing -System model – Pre-coding -Beam forming –Space Time Coding, Alamouti scheme -Channel state information-capacity in fading and non-fading channels- combining techniques-Selection combining, Equal gain combining, Maximum ratio Combining, RAKE receiver. Introduction to OFDM		
		Total: 45

Further Reading:	
	WANET, IoT, Zigbee Technology, WiMax, WLAN
Course Outcomes:	
	After completion of the course, Student will be able to
	1. Characterize interference between mobile and base stations.

	2. Apply the knowledge in understanding the allocation of the limited wireless spectrum by government regulatory agencies
	3. Predict the received signal through the multipath channel.
	4. Analyze and Evaluate receiver and transmitter diversity techniques.
	5. Analyze the multiple antenna techniques

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References:

1. Rappaport. T.S., **"Wireless Communications: Principles and Practices"**, Second Edition,PHI, 2014
2. Andrea Goldsmith, **"Wireless Communication"**, Cambridge University Press, 2005
3. Andreas.F.Molisch, **"Wireless Communications"**, John Wiley, 2010
4. John G. Proakis, **"Digital Communication"**McGraw Hill, 4th Edition, 2008
5. Gordon L.Stuber, **"Principles of Mobile Communication"**, 3rd Edition, Springer International Ltd.,2011
6. William C Lee, **"Wireless and Cellular Communications"** 3rd Edition McGraw Hill, 2006

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

1702EC704	IMAGE PROCESSING	L	T	P	C
		3	0	0	3
	(Common to ECE/CSE/IT)				

Course Objectives:

1. To make the students to understand the digital image fundamentals.
2. To study the digital image using different transforms.
3. To acquire the basic knowledge in filters, image enhancement, image restoration and compression techniques.

Unit I DIGITAL IMAGE FUNDAMENTALS **9 Hours**

Elements of digital image processing systems, Elements of visual perception, Image sampling andquantization, Basic Relationships between pixels. Image Transforms:Discrete Fourier transform, Cosine,Hadamard, Haar, Walsh and Slant transform.

Unit II IMAGE ANALYSIS **9 Hours**

Histogram processing, basic enhancement specification techniques,Basics of spatial filtering, Smoothing spatial filters, Sharpening spatial filters, Image smoothing and sharpening using frequency domain filters.

Unit III IMAGE SEGMENTATION **9 Hours**

Point, line and edge detection-Detection of isolated points, Line detection, Edge models, Basic edgedetection, Edge linking and boundary detection. Thresholding-basic global thresholding, Otsu's method,Multiple, Variable and multivariable thresholding, Region-based segmentation-Region growing, Regionsplitting and merging.

Unit IV IMAGE RESTORATION AND RECOGNITION **9 Hours**

Image degradation/ restoration model, Noise models, Restoration-Spatial Filtering, Constrained Leastsquare filtering, Inverse filtering, Wiener Filtering, Object recognition-Patterns and patternclasses,Matching-Minimum Distance classifiers, Neural networks-Background, Training by Back Propagation.

Unit V IMAGE COMPRESSION **9 Hours**

Fundamentals, Basic compression methods-Huffman coding, Golomb coding, Arithmetic coding, LZW coding, Run – length coding, Lossless and Lossy predictive coding, Block transform coding, Waveletcoding.

Total: 45 Hours

Further Reading:

KL transform and their properties, Homomorphic filtering, Morphological image processing – Erosion and Dilation, Opening and closing, Segmentation using morphological watersheds, Applications of neural networks in image processing, Digital image watermarking.

Course Outcomes:

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After completion of the course, Student will be able to

1. Analyze the image using image transforms.
2. Develop a methodology for smoothening and sharpening of the image

	3. Segment the image using edge detection, thresholding and region based approach.
	4. Develop a method to restore the image and object recognition
	5. Compress the image using lossy and lossless compression techniques.

References:

1. C.Rafeal Gonzalez and E.Richard Woods, Digital Image Processing, Third Edition, Pearson Education 2008.
2. Anil K.Jain, Fundamentals of Digital Image Processing, PHI, 2010.
3. S Jayaraman, S Esakkirajan T Veerakumar, Digital Image Processing , Mc Graw- Hill, 2010
4. K.William Pratt, Digital Image Processing, John Wiley, 1997.
5. M.A.Sid Ahmed, Image Processing Theory, Algorithm and Architectures, McGraw - Hill, 1995.

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore, 611 002
Nagapattinam (Dt) Tamil Nadu.

1702EC751	Microwave and Optical Communication Lab	L	T	P	C
		0	0	4	2

Course Objectives:

1. To have a detailed practical study on microwave equipmentsand microstrip components.
2. To study the optical devices and to use in appropriate application.

List of Experiments:

MICROWAVE EXPERIMENTS:

1. Reflex Klystron – Mode characteristics
2. Gunn Diode – Characteristics
3. VSWR, Frequency and Wave Length Measurement
4. Directional Coupler – Directivity and Coupling Coefficient – S – parameter Measurement
5. Circulator – S - parameter measurement
6. Attenuation and Power measurement
7. S - matrix Characterization of E-Plane T, H-Plane T and Magic T.
8. Radiation Pattern of Antennas.
9. Antenna Gain Measurement

OPTICAL EXPERIMENTS:

1. DC characteristics of LED and PIN Photo Diode.
2. Mode Characteristics of Fibers.
3. Measurement of Connector and Bending Losses.
4. Fiber Optic Analog and Digital Link
5. Numerical Aperture Determination for Fibers
6. Attenuation Measurement in Fibers.

Content Beyond:

- Study of Manchester coding.

Total: 45 Hours

Course Outcomes:

After completion of the course, Student will be able to

1. Able to study and analyze microwave equipments.
2. Able to study and analyze optical devices.

1703MG001	PRINCIPLES OF MANAGEMENT	L	T	P	C
		3	0	0	3

Course Objectives:

1. To enable the students to study the evolution of Management
2. To study the functions and principles of management
3. To learn the application of the principles in an organization

Unit I	**INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS**	**9 Hours**

Definition of Management - Science or Art - Manager Vs Entrepreneur - Types of managers - managerial roles and skills – Evolution of Management – Scientific, Human relations , System and contingency approaches – Types of Business organization - Sole proprietorship, partnership, Company-public and private sector enterprises - Organization culture and Environment – Current trends and issues in Management.

Unit II	**PLANNING**	**9 Hours**

Nature and purpose of planning – Planning Process – Types of planning – Objectives – Setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

Unit III	**ORGANISING**	**9 Hours**

Nature and purpose – Formal and informal organization – Organization chart – Organization structure – Types – Line and staff authority – Departmentalization – Delegation of authority – Centralization and Decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, Selection, Training and Development, Performance Management , Career planning and Management.

Unit IV	**DIRECTING**	**9 Hours**

Foundations of Individual and Group behaviour – Motivation – Motivation theories – Motivational techniques – Job satisfaction – Job enrichment – Leadership – Types and theories of leadership – Communication – Process of communication – Barrier in communication – Effective communication –Communication and IT.

Unit V	**CONTROLLING**	**9 Hours**

System and process of controlling – Budgetary and non-budgetary control techniques – Use of computers and IT in Management control – Productivity problems and management – Control and performance – Direct and preventive control – Reporting.

	Total:	**45 Hours**

Further Reading:

1. Decision roles of managers.
2. Motivational thoughts.

Course Outcomes:

After completion of the course, Student will be able to

1. Explain the elements of Management and Organization.
2. Summarize the types, policies, tools and techniques in Planning in Management
3. Relate the job design and human resource management in Organizing
4. Illustrate the skills of leadership and communication
5. Interpret the controlling techniques in Management

References:

1. Stephen A. Robbins & David A. Decenzo & Mary Coulter, "Fundamentals of Management" 7 th Edition, Pearson Education, 2011.
2. Stephen P. Robbins & Mary Coulter, "Management", 10th Edition,Prentice Hall (India) Pvt. Ltd., 2009.
3. Robert Kreitner & Mamata Mohapatra, " Management", Biztantra, 2008.

4.	JAF Stoner, Freeman R.E and Daniel R Gilbert "Management", 6 th Edition,Pearson Education, 2004.
5.	Tripathy PC & Reddy PN, "Principles of Management", Tata McGraw Hill, 1999
6.	Harold Koontz & Heinz Weihrich "Essentials of management" Tata McGraw Hill,1998.

1703MG002	DISASTER MANAGEMENT	L	T	P	C
		3	0	0	3

Course Objectives:

1. To provide an exposure to disasters, their significance and types.
2. To understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
3. To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)

Unit I INTRODUCTION TO DISASTERS **9 Hours**

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc – Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Dos and Don'ts during various types of Disasters.

Unit II APPROACHES TO DISASTER RISK REDUCTION (DRR) **9 Hours**

Disaster cycle – Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies

Unit III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT **9 Hours**

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc – Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India – Relevance of indigenous knowledge, appropriate technology and local resources.

Unit IV DISASTER RISK MANAGEMENT IN INDIA **9 Hours**

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional Arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy) - Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

Unit V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS **9 Hours**

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management

Total: 45 Hours

Further Reading:

1. Discussion about the Air Pollution and Nuclear pollution - case studies
2. DRR Master Planning for the Future

Course Outcomes: - Skill Development

After completion of the course, Student will be able to

1. Develop an understanding of the key concepts, definitions a key perspectives of all Hazards Emergency Management
2. Differentiate the types of disasters, causes and their impact on environment and society
3. Assess vulnerability and various methods of risk reduction measures as well as mitigation.
4. Draw the hazard and vulnerability profile of India, Scenarios in the Indian context,
5. Disaster damage assessment and management

References:
1. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012
2. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
3. KapurAnu Vulnerable India. A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010
4. Dr.Mrinalinipandey- "Disaster Management", wiley India Pvt Ltd.
5. C. K. Rajan. NavalePandharinath"Earth and Atmospheric Disaster Management : Nature an Manmade" B S Publication
6. Shailesh Shukla, Shamna Hussain "Biodiversity, Environment and Disaster Management Unique Publications

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

1703MG005	TOTAL QUALITY MANAGEMENT	L	T	P	C
		3	0	0	3

Course Objectives:

1. To learn concepts, dimension quality and philosophies of TQM.
2. To study the TQM principles and its strategies.
3. To impart knowledge on TQM tools for continuous improvement.

Unit I INTRODUCTION **9 Hours**

Definition of Quality - Dimensions of Quality - Quality Planning - Quality costs - Analysis Techniques for Quality Costs - Basic concepts of Total Quality Management - Historical Review - Quality Statements - Strategic Planning, Deming Philosophy - Crosby philosophy - Continuous Process Improvement - JuranTrilogy, PDSA Cycle, 5S, Kaizen - Obstacles to TQM Implementation

Unit II TQM PRINCIPLES **9 Hours**

Principles of TQM, Leadership - Concepts - Role of Senior Management - Quality Council, Customer satisfaction - Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement - Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits - Supplier Partnership - Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures - Basic Concepts, Strategy, Performance Measure

Unit III STATISTICAL PROCESS CONTROL (SPC) **9 Hours**

The seven tools of quality - Statistical Fundamentals - Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables X bar and R chart and attributes P, NP, C, and u charts, Industrial Examples, Process capability, Concept of six sigma - New seven Management tools

Unit IV TQM TOOLS **9 Hours**

Benchmarking - Reasons to Benchmark - Benchmarking Process, Quality Function Deployment(QFD)- House of Quality, QFD Process, and Benefits - Taguchi Quality Loss Function - Total Productive Maintenance (TPM) - Concept, Improvement Needs, and FMEA - Stages of FMEA- Casestudies

Unit V QUALITY SYSTEMS **9 Hours**

Concept, Requirements of ISO 9000 and Other Quality Systems - ISO 9000:2000 Quality System - Elements, Implementation of Quality System, Documentation, Quality Auditing, ISO 9000:2005 and 9001:2015, ISO 14000.

Total: 45 Hours

Further Reading:

1. Case Study: TQM Quality and Environmental Concepts in real World Applications
2. Environment Management system

Course Outcomes:

	After completion of the course, Student will be able to
	1. Understand the concepts, dimension quality and philosophies of TQM.
	2. Understand the principles of TQM and its strategies.
	3. Apply seven statistical quality and management tools
	4. Understand TQM tools for continuous improvement.
	5. Understand the QMS and EMS
References:	
1.	Rathakrishnan, Gas Dynamics, 5th edition, PHI Learing Private Limited,2013.
2.	N. Gupta and S. Valarmathi, Total Quality Management, Tata McGraw-Hill Publishing Company Pvt. Ltd., New Delhi,2009.
3.	S. Kumar, Total Quality Management, Laxmi Publications Ltd. New Delhi,2006
4.	P.N. Mukherjee, Total Quality Management, Prentice Hall of India, New Delhi,2006.
5.	DaleH.Besterfiled, Total Quality Management, Pearson Education Inc., New Delhi,2003.
6.	James R. Evans and William M. Lidsay, The Management and Control of Quality, South- Western2002.

1703MG006	INDUSTRIAL ECONOMICS	L	T	P	C
		3	0	0	3
Course Objectives:					
1.	To introduce the concepts of micro, macroeconomic systems and business decisions in industry.				
2.	To acquire knowledge on laws of demand & supply and methods of forecasting thedemand				
3.	To emphasis the systematic evaluation of the costs, breakeven point for return on economics and diseconomics				
Unit I	INTRODUCTION				**9 Hours**
Introduction to Industrial economics- Micro and Macro economics - Kinds of Economic Systems - Production Possibility Frontier - Opportunity Cost - Objective of Organizations - Kinds of Organization.					
Unit II	DEMAND AND SUPPLY				**9 Hours**
Functions of Demand and Supply - Law of diminishing Marginal Utility - Law of Demand and Supply Elasticity of Demand - Demand Forecasting Methods - Indifference curve.					
Unit III	PRODUCTION AND COST				**9 Hours**
Production Function - Returns to Scale - Law of Variable Proportion - Cost and Revenue concepts and Cost Curves - Revenue curves - Economies and Dis-Economies of scale - Break Even point.					
Unit IV	MARKET STRUCTURE				**9 Hours**
Market Structure - Perfect Competition - Monopoly - Monopolistic - Oligopoly - Components of Pricing - Methods f Pricing - Capital Budgeting IRR - ARR - NPV - Return on Investment - Payback Period.					
Unit V	INTRODUCTION TO MACRO ECONOMICS AND FINANCIAL ACCOUNTING				**9 Hours**
National Income - Calculation Methods - Problems - Inflation - Deflation - Business Cycle - Taxes - Direct and Indirect Taxes - Fiscal and monetary policies.					
		Total:			**45 Hours**
Further Reading:					
1.	Nature and characteristics of Indian Economy				
2.	Role and Functions of Central bank - LPG - GATT - WTO.				
Course Outcomes:					
	After completion of the course, Student will be able to				

Unit V	BUSINESS DYNAMICS – ENGINEERING SERVICES INDUSTRY	9 Hours
The Industry - Engineering Services Industry - Product Development in Industry versus Academia –The IPD Essentials - Introduction to Vertical Specific Product Development Processes - Product Development Trade-offs - Intellectual Property Rights – Security and Configuration Management.		
	Total:	**45 Hours**

Further Reading:

1. Rapid Prototyping and Rapid Manufacturing
2. PESTLE Analysis

Course Outcomes:

After completion of the course, Student will be able to

1. Define, formulate and analyze a problem
2. Solve specific problems independently or as part of a team
3. Gain knowledge of the Innovation & Product Development process in the Business Context
4. Work independently and also in teams
5. Manage a project from beginning to end

References:

1. Mark S Sanders and Ernest J McCormick, "Human Factors in Engineering and Design", McGraw Hill Education, Seventh Edition, 2013
2. Hiriyappa B, —Corporate Strategy – Managing the Businessl, Author House, 2013.
3. Karl T Ulrich and Stephen D Eppinger, "Product Design and Development", Tata McGraw Hill, Fifth Edition, 2011.
4. John W Newstorm and Keith Davis, "Organizational Behavior", Tata McGraw Hill, Eleventh Edition, 2005
5. 4. Peter J. Drucker – –People and Performancel, Butterworth – Heinemann [Elsevier], Oxford, 2004.
6. Vinod Kumar Garg and Venkita Krishnan N K

Professional Electives – VI

1703EC021	ADVANCED DIGITAL SIGNAL PROCESSING	L	T	P	C
		3	0	0	3

Course Objectives: To provide in-depth treatment on methods and techniques in

1. Discrete-time signal transforms, digital filter design, optimal filtering
2. Power spectrum estimation, multi-rate digital signal processing
3. DSP architectures which are of importance in the areas of signal processing, control and communications.

Unit I	Parametric Methods for Power Spectrum Estimation	9 Hours
Relationship between Auto Correlation and Model Parameters: The Yule Walker method for the AR model parameters - the Burg method for the AR model parameters – unconstrained least square method for the AR model parameters - sequential estimation methods for the AR model parameters.		
Unit II	**Non-Parametric Methods for Power Spectrum Estimation**	**9 Hours**
Estimation of spectra from finite duration observation of signals; Non-Parametric Methods: Bartlett - Welch and Blackman - Tukey method.		
Unit III	**Adaptive Signal Processing**	**9 Hours**
FIR Adaptive Filters: Steepest descent adaptive filter - LMS algorithm - convergence of LMSalgorithms; Applications: Noise cancellation - channel equalization; Adaptive recursivefilters - recursive least squares.		
Unit IV	**Multirate Signal Processing**	**9 Hours**
Decimation by a factor D – Interpolation by a factor I – Filter design and implementation forsampling rate conversion; Direct form FIR filter structures - Polyphase filter structure.		
Unit V	**Discrete Transforms**	**9 Hours**
Discrete Transforms: Discrete Fourier transform - discrete cosine transform; WaveletTransform: Introduction - Haar scaling functions and function spaces- nested spaces –Haarwavelet function - orthogonality of $\varphi(t)$ and $\psi(t)$ -		

normalization of Haar bases at differentscales - Daubechies wavelets -support of wavelet system.		
	Total:	**45 Hours**
Further Reading:	http://www.ti.com/processors/dsp/overview.html	

Course Outcomes:

After completion of the course, Student will be able to

1. To design adaptive filters for a given application
2. To design multirate DSP systems.

Employability / Entrepreneurship

References:

1. J.G. Proakis and D.G. Manolakis, 'Digital Signal Processing Principles, Algorithms and Applications', Pearson Education, New Delhi, PHI, 2005.
2. Monson H. Hayes, "Statistical Digital Signal Processing and Modeling", Wiley, 2002.
3. Roberto Crist, "Modern Digital Signal Processing", Thomson Brooks/ Cole, 2004.
4. Raghuveer M. Rao and Ajit S. Bopardikar, 'Wavelet Transforms: Introduction to Theoryand Applications", Pearson Education, Asia, 2000.
5. K. P Soman, K. I Ramachandran and N G Reshmi, "Insights into Wavelets: From
6. Theory to Practice", 3rd Edition, Prentice Hall of India, 2010.

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

1703EC022	EMBEDDED SYSTEMS	L	T	P	C
		3	0	0	3

Course Objectives:

1. In this course it is aimed to Understand the fundamentals of embedded systems differences of microprocessor and controller.
2. Understand the microcontroller architecture and pin diagrams.
3. Understand and able to write the assemble language program.
4. Understand and able to write the I/O and timers/counter programming
5. To use the embedded controllers In real time applications

Unit I Embedded system introduction	**9 Hours**

Introduction to embedded system, embedded system architecture, classifications of embedded systems, challenges and design issues in embedded systems, fundamentals of embedded processor and microcontrollers, CISC vs. RISC, fundamentals of Vonneuman/Harvard architectures, types of microcontrollers, selection of microcontroilers.

Unit II Microcontroller (89C51 & 89S51 & 89S52)	**9 Hours**

Microcontroller-Pin diagram of each series -Complete Pin description-Difference between 8031, 8051, 8052-Addressing modes -Instruction sets used in ATMEL-Types of instructions -Timers/Counters with I/O ports -Applications using timers counters-Simple programs.

Unit III AVR Architecture	**9 Hours**

Brief History of AVR Microcontrollers, Architecture of AVR Atmega32x Microcontroller, Pin diagram, AVR Family Overview, Atmega32 Family Members, AVR Assembly Language Programming.

Unit IV I/O Device Interfacing	**9 Hours**

Assembly Language and Embedded C Programming- Interfacing Simple I/O Devices Like LED, Seven Segment, LCD, Switches -89c51 and AVR controller.

Unit V Embedded controllers Application	**9 Hours**

Sensor Interfacing and Signal Conditioning, Relay Interfacing, Opto isolator and Stepper Motor Interfacing, PWM Programming and DC Motor Control and various control applications.

	Total:	**45Hours**
Further Reading:	Serial communications, i2c communications	

Course Outcomes:

After completion of the course, Student will be able to

	1. Understand the micro and macroeconomic environment for a favorable business environment
	2. Apply laws of demand and supply in engineering economy and forecast the demand
	3. Evaluate the various costs and breakeven point for organizational profitability
	4. Analyze the pricing, payback on investments and e-commerce completions.
	5. Asses the influence of macro level economics, taxation in businesses and financial accounting process
References:	
1. A Ramachandra Aryasri and V V Ramana Murthy, Engineering Economics and Financial Accounting, Tata McGraw Hill Publishing Company Limited, New Delhi,2006.	
2. R Kesavan, C Elanchezhian and T Sunder Selwyn, Engineering Economics and Financial Accounting, Laxmi Publication Ltd. New Delhi,2005.	
3. V L Samuel Paul and G S Gupta,Managerial Economics Concepts and Cases, Tata McGraw Hill Publishing Company Limited. New Delhi,1981.	
4. S N Maheswari, Financial and Management Accounting, SultanChand	
5. V L Samuel Paul and G S Gupta, Managerial Economics-Concepts andCases.	
6. Banuwal R.R., Industrial Economics - An Introductory Text Book, New Age.	

1703MG007	FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Course Objectives:

1. To understand the recent subsequent development of global trends and development methodologies of various types of products and services
2. To conceptualize, prototype and develop product management plan for a new product based on the type of the new product and development methodology integrating the hardware, software, controls, electronics and mechanical systems
3. To understand requirement engineering and know how to collect, analyze and arrive at requirements for new product development and convert them in to design specification

Unit I	FUNDAMENTALS OF PRODUCT DEVELOPMENT	**9 Hours**
Introduction to Product Development Methodologies and Management - Overview of Products and Services - Types of Product Development - Overview of Product Development methodologies - Product Life Cycle – Product Development Planning and Management.		
Unit II	REQUIREMENTS AND SYSTEMDESIGN	**9 Hours**
Requirement Engineering - Types of Requirements - Quality Function Deployment & Phases - Modeling - Requirement Management - Introduction to System Modeling – System Optimization-System Specification.		
Unit III	DESIGN AND TESTING	**9 Hours**
Introduction to Concept generation Techniques - Concept Screening & Evaluation - Detailed Design - Component Design and Verification - High Level /Low Level product Design - S/W Testing- Hardware Schematic, Component design, Layout and Hardware Testing.		
Unit IV	SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT	**9 Hours**
Sustenance -Maintenance and Repair – Enhancements - Product EOL - Obsolescence Management – Configuration Management - EOL Disposal		

	1. Explain 8051,52 and AVR Microcontroller Architecture.
	2. Develop an Assembly Language Program..
	3. Build an interface for I/O Devices using Embedded C and ALP
	4. Make use of internal and external peripherals.
	5. Develop an Interface for Sensors and Actuators.
References:	
1.	Programming PIC microcontrollers with PIC basic by chuck helebuyck
2.	PIC microcontrollers-programming in basic by Milan verle.
3.	Mohammad Ali Mazidi, Sarmad Naimi, SepehrNaimi; The AVR Microcontroller and Embedded Systems using Assembly and C; 1stEdition,Pearson Education India.
4.	Dhananjay Gadre, Programming and Customizing the AVR Microcontroller; 1 st Edition, McGraw Hill.
5.	The 8051 Microcontroller and Embedded Systems Using Assembly and C Second Edition Muhammad Ali Mazidi Janice GillispieMazidi Rolin D. McKinlay

	EMBEDDED SYSTEMS LABORATORY		
List of Experiments:			
1.	StudyofARMevaluationsystem		
2.	InterfacingADC andDAC		
3.	Interfacing LCDand PWM		
4.	Interfacing real timeclock and serial port		
5.	Interfacingkeyboard,stepper motor and CLCD		
6.	InterfacingEPROMand interrupt		
7.	Mailbox		
8.	Interrupt performancecharacteristicsofARMandFPGA		
9.	FlashingofLED's		
10.	Interfacingstepper motor andtemperaturesensor		
11.	Implementation ofCANprotocol with ARM		
		Total:	**45 Hours**
Additional Experiments:			
1.	LCD display using Arduino processor		
2.	Interfacing of keyboard and serial port using Arduino processor		
Course Outcomes:			
After completion of the course, Student will be able to			
1.	Writeprograms in ARMforaspecificApplication		
2.	Interface A/Dand D/Aconvertorswith ARMsystem		
3.	Writeprogrammesforinterfacingkeyboard,display,motorandsensor		
4.	Formulatemini project inembeddedsystem		
References:			
1.	Sedra and Smith, "Micro Electronic Circuits", Sixth Edition, Oxford University Press, 2011		
2.	Robert L. Boylestad and Louis Nashelesky, "Electronic Devices and Circuit Theory", 10th Edition, Pearson Education, PHI, 2008		
3.	David A. Bell, "Electronic Devices and Circuits", Fifth Edition, Oxford University Press, 2008		
4.	Millman J. and Taub H., "Pulse Digital and Switching Waveforms", TMH, 2000		
5.	Millman and Halkias C., Integrated Electronics, TMH, 2007		

Entrepreneurship

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

1703EC923	PATTERN RECOGNITION AND MACHINE LEARNING	L	T	P	C
		3	0	0	3
	(Common to B.E / B.Tech – CSE, IT & ECE)				
Course Objectives:					
1.	Provide knowledge of models, methods and tools used to solve regression, classification, feature selection and density estimation problems				
2.	Provide knowledge of learning and adaptation in supervised modes of learning				
3.	Provide knowledge of recognition, decision making and statistical learning problems.				

	4. Provide knowledge of current research topics and issues in Pattern Recognition and Machine Learning
	5. Provide knowledge about linear functions

Unit I	SPEECH FUNDAMENTALS	**9 Hours**

Articulatory Phonetics – Production and Classification of Speech Sounds; Acoustic Phonetics – acoustics of speech production; Review of Digital Signal Processing concepts; Short-Time Fourier Transform, Filter-Bank and LPC Methods

Unit II	VLSI SIGNAL PROCESSING	**9 Hours**

An overview of DSP concepts- Representations of DSP algorithms.- Loop bound and iteration bound-Transformation Techniques: Retiming, Pipelining and Unfolding

Unit III	RF SYSTEM DESIGN	**9 Hours**

Characteristics- amplifier power relations- stability considerations- constant gain circles- constant VSWR circles- low noise circles broadband- high power and multistage amplifiers.

Unit IV	MULTIMEDIA COMMUNICATION	**9 Hours**

Introduction - Multimedia Skills - Multimedia components and their characteristics - Text, sound, images, graphics, animation, video, hardware

Unit V	CLOUD COMPUTING	**12 Hours**

Technologies for Network-based System - System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture. Cloud Models:- Characteristics – Cloud Services – Cloud models (IaaS, PaaS, SaaS) – Public vs Private Cloud -Cloud Solutions - Cloud ecosystem – Service management – Computing on demand.

	Total:	**45 + 15 Hours**

Further Reading:

Dimensional Reduction and Model Selection, On Feature Selection in Gaussian Mixture Clustering

Course Outcomes:

Employability

After completion of the course, Student will be able to

1.Identify areas where Pattern Recognition and Machine Learning can offer a solution

2: Describe the strength and limitations of some techniques used in computational Machine Learning for classification, regression and density estimation problems

3. Describe genetic algorithms, validation methods and sampling techniques

4 .Describe some discriminative, generative and kernel based techniques

5 .Describe and model sequential data

References:

1.Lawrence Rabiner and B. Juang, "Fundamentals of Speech Recognition", Pearson Education, 2003

2. Keshab K. Parhi, "VLSI Digital Signal Processing Systems: Design and Implementation", Wiley, inter science

3.Reinhold Ludwig and P. Bretchko, "RF Circuit Design -- Theory and Applications, Pearson Education Asia, First Edition, 2001

Dr. S. RAMABALAN, M.E., PH.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

1703EC024	SPEECH PROCESSING	L	T	P	C
		3	0	0	3

Course Objectives:

1. To make the students to understand the digital Speech fundamentals.
2. To study the digital models and processing of speech signal
3. To acquire the basic knowledge in filters, voice enhancement, voice restoration and compression techniques.

Unit I	SPEECH PRODUCTION MODEL	**9 Hours**

1D sound waves-functional block of the vocal tract model –Linear predictive co- efficients (LPC) -Auto-correlation method-Levinson-durbin algorithm-Auto-co- variance method-Lattice structure-Computation of

Lattice co-efficient from LPC-Phonetic Representation of speech-Perception of Loudness - Critical bands – Pitch perception – Auditory masking.		
Unit II	**FEATURE EXTRACTION OF THE SPEECH SIGNAL**	**9 Hours**
Endpoint detection-Dynamic time warping- Pitch frequency estimation: Autocorrelation approach- Homomorphic approach-Formant frequency estimation using vocal tract model and Homomorphic approach-Linear predictive co-efficient -Poles of the vocal tract-Reflection co-efficient-Log Arearatio		
Unit III	**FREQUENCY DOMAIN METHODS FOR SPEECH PROCESSING**	**9 Hours**
Cepstrum- Line spectral frequencies- Functional blocks of the ear- Mel frequency cepstral co-efficients-Spectrogram-Time resolution versus frequency resolution-Discrete wavelettransformation.		
Unit IV	**PATTERN RECOGNITION FOR SPEECH DETECTION**	**9 Hours**
Back-propagation Neural Network-Support Vector Machine- Hidden Markov Model (HMM)-Gaussian Mixture Model(GMM) -Unsupervised Learning systems- K-Means and Fuzzy K-means clustering - Kohonen self-organizing map- Dimensionality reduction techniques: Principle component analysis (PCA), Linear discriminant analysis (LDA), Kernel-LDA (KLDA), Independent component analysis(ICA).		
Unit V	**SPEECH ANALYSIS AND SYNTHESIS**	**9 Hours**
Non-uniform quantization for Gaussian distributed data- Adaptive quantization-Differential pulse code modulation-Code Exited Linear prediction (CELP)- Quality assessment of the compressed speech signal Text to Speech (TTS) analysis –Evolution of speech synthesis systems-Unit selection methods - TTS Applications		
	Total:	**45 Hours**

Further Reading:

Phonetic Mechanisms in Speech Perception
Disorders of Peripheral and Central Auditory Processing
Neurobiology of Statistical Information Processing in the Auditory Domain

Course Outcomes:

After completion of the course, Student will be able to

1. Illustrate how the speech production is modeled
2. Summarize the various techniques involved in collecting the features from the speech signal in both time and frequency domain
3. Summarize the functional blocks of the ear.
4. Compare the various pattern recognition techniques involved in speech and speaker detection
5. Summarize the various speech compression techniques

References:

1. *L.R.Rabiner and R.W.Schafer," Introduction to Digital speech processing",now publishers USA,2007*
2. *E.S.Gopi,"Digital speech processing using matlab",Springer,2014*
3. *L.R.Rabiner and R.W.Schafer,"Digital processing of speech signals", PrenticeHall,1978*
4. *T.F.Quatieri,"Discrete-time Speech Signal Processing", Prentice-Hall, PTR,2001*
5. *L.Hanzaelal,"Voice Compression and Communications", Wiley/ IEEE ,2001.*

1703EC025	VLSI Signal Processing	L	T	P	C
		3	0	0	3

Course Objectives:

1. To enable students to design VLSI systems with high speed and low power.
2. To encourage students to develop a working knowledge of the central ideas of implementation of DSP algorithm with optimized hardware.

Unit I	**INTRODUCTION TO DSP SYSTEMS**	**9 Hours**
An overview of DSP concepts, Representations of DSP algorithms. Systolic Architecture Design: FIR Systolic Array, Matrix-Matrix Multiplication, 2D Systolic Array Design. Digital Lattice Filter Structures: Schur Algorithm,		

Derivation of One-Multiplier Lattice Filter, Normalised Lattice Filter, Pipelining of Lattice Filter.		
Unit II	PIPELINING AND RETIMING	**9 Hours**
Scaling and Round off Noise - State variable description of digital filters, Scaling and Round off Noise computation, Round off Noise in Pipelined IIR Filters, Round off Noise Computation using state variable description, Slow-down, Retiming and Pipelining.		
Unit III	BIT-LEVEL ARITHMETIC ARCHITECTURES	**9 Hours**
Bit level arithmetic architectures- parallel multipliers, interleaved floor-plan and bit-plane- based digital filters, Bit serial multipliers, Bit serial filter design and implementation, Canonic signed digit arithmetic, Distributed arithmetic.		
Unit IV	REDUNDANT ARITHMETIC	**9 Hours**
Redundant arithmetic- Redundant bit representations carry free radix-2 addition and subtraction, Hybrid radix-4 addition, Radix-2 hybrid redundant multiplication architectures, data format conversion, Redundant to Non redundant converter.		
Unit V	NUMERICAL STRENGTH REDUCTION	**9 Hours**
Numerical Strength Reduction - Subexpression Elimination, Multiple Constant Multiplication, Subexpression Sharing in Digital Filters, Additive Number Multiplier, Number Splitting.		
	Total:	**45 Hours**

Further Reading:

1. Special decoders
2. Systolic array processing

Entrepreneurship/ Employability

Course Outcomes:

After completion of the course, Student will be able to

1. Understand basics of DSP systems
2. Know about algorithmic strength reduction
3. Convolve IIR filters
4. Identify bit level arithmetic algorithms
5. Compare protocols

References:

1. Keshab K. Parhi " VLSI Digital Signal Processing Systems, Design and implementation ", Wiley, Interscience, 1999.
2. U. Meyer – Baese " Digital Signal Processing with Field Programmable Gate Arrays", Springer, Second Edition, 2004.

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

1703EC026	RF SYSTEM DESIGN	L	T	P	C
		3	0	0	3

Course Objectives:

1. To understand the basics of system design
2. To understand the concepts of radio architectures
3. To introduce to the students the transmitter and receiver system design techniques and analysis
4. To learn the applications of RF systems in wireless communication.

Unit I	TRANSCEIVER ARCHITECTURES	**9 Hours**
Heterodyne and Homodyne architectures, Discrete and CMOS realization passive components for RF, Impedance Matching, Detection, IIP3 and Blocking Effects, Noise Figure, Noise matching conditions. Friis Formula for cascaded blocks.		
Unit II	CMOS LNAS AND MIXERS	**9 Hours**
Noise Figure of and impedance matching issues CS, CG and differential LNAs, Passive mixers and conversion		

loss, Active mixers, Gilbert cells, linearity and Noise Figure of mixers		
Unit III	OSCILLATORS	**9 Hours**
Negative transconductance, nonlinearity, and Differential LC tuned oscillators, Ring oscillators and Colpitts oscillator, Quadrature oscillators–Phase noise		
Unit IV	PLLS AND SYNTHESIZERS	**9 Hours**
Phase Detectors, charge pumps and their transfer functions, Synthesizers based on first, second and third order PLLs and stability issues, Introduction to integer and fractional N synthesizers		
Unit V	POWER AMPLIFIERS	**9 Hours**
Class A, B, C, D, E, F and AB power amplifiers, Linearization and impedance matching issues of power amplifiers.		
	Total:	**45 Hours**

Further Reading:

Measurement of noise, jitter, SFDR, intermodulation products for RF system

Course Outcomes:

After completion of the course, Student will be able to

1. Understand radio transceiver architectures
2. Design and Analyze CMOS LNAs , Mixers
3. Design and Analyze Oscillators, PLLs,
4. Design and Analyze synthesizers and Power Amplifiers.

References:

1. B. Razavi, —RF Microelectronics‖, Pearson Education, 2nd edition, 2012.
2. Thomas Lee, —The Design of CMOS Radio Frequency Integrated Circuits, Cambridge University Press, Second Edition, 2004.
3. Zhipei Chi, *High Performance, High Speed VLSI Architectures for Wireless Communication Applications* University of Minnesota, 2000.

E.G.S.PILLAYENGINEERINGCOLLEGE

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NAGAPATTINAM–611002

B.E. Electronics and Communication Engineering

Full Time Curriculum and Syllabus

Fourth Year– Eighth Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
	Professional Elective -VII	3	-	-	3	40	60	100
	Professional Elective -VIII	3	-	-	3	40	60	100
	Professional Elective – IX	3	-	-	3	40	60	100
Laboratory Course								
1704EC851	Project Work	-	-	18	9	50	50	100
	Total	**9**	-	**18**	**18**	**170**	**230**	**400**
Professional Elective - VII								
1703EC027	Multimedia Communication	3	0	0	3	40	60	100
1703EC028	Wireless Sensor Networks	3	0	0	3	40	60	100
1703EC029	Radar and Navigation Aids	3	0	0	3	40	60	100
1703EC030	Microwave Integrated Circuits	3	0	0	3	40	60	100
1703EC031	Satellite Communication	3	0	0	3	40	60	100
Professional Elective – VIII								
1703EC032	System on Chip Design	3	0	0	3	40	60	100
1703EC033	Network on Chip Design	3	0	0	3	40	60	100
1703EC034	Low Power VLSI Design	3	0	0	3	40	60	100
1703EC035	Analog IC Design	3	0	0	3	40	60	100
1703EC036	Mixed Signal CMOS Design	3	0	0	3	40	60	100

Professional Elective - IX								
1703EC037	Electromagnetic Interference and Compatibility	3	0	0	3	40	60	100
1703EC038	Digital System Design and Testing	3	0	0	3	40	60	100
1703EC039	Optical Networks	3	0	0	3	40	60	100
1703EC040	RF MEMS	3	0	0	3	40	60	100
1703EC041	Digital Switching and Transmission	3	0	0	3	40	60	100
1703EC042	ARM Processors	3	0	0	3	40	60	100
1703EC043	Mobile Computing	3	0	0	3	40	60	100

Professional Elective – VII

1703EC027	MULTIMEDIA COMMUNICATIONS	L	T	P	C
		3	0	0	3
	(Common to B.E / B.Tech –ECE, CSE, IT)				

Course Objectives:

1. To have a detailed knowledge of compression and decompression techniques
2. To introduce the concepts of multimedia communication
3. To introduce standards of MPEG

Unit I	**Introduction to Multimedia Communications**	**5 Hours**

Components of multimedia system. Desirable features, Applications of multimedia systems, Introduction to different types. Multimedia storage device.

Unit II	**Digital audio representation**	**9 Hours**

Digital audio representation and processing-time domain and transform domain representations. Coding standards, transmission and processing of digital audio. Musical instrument synthesizers.

Unit III	**Image coding algorithms**	**12 Hours**

Still image coding-JPEG. Discrete cosine Transform. Sequential and Progressive DCT based encoding algorithms, lossless coding, hierarchical coding. Basic concepts of discrete wavelet transform coding and embedded image coding algorithms. Introduction to JPEG2000.

Unit IV	**MPEG**	**9 Hours**

Feature of MPEG 1, structure of encoding and decoding process, MPEG 2 enhancements, and different blocks of MPEG video encoder.

Unit V	**Video coding**	**10 Hours**

Content based video coding, overview of MPEG 4 video, motion estimation and compensation. Different coding techniques and verification models. Block diagram of MPEG 4 video encoder and decoder. An overview of H261 and H263 video coding techniques.

Total:	**45**

Further Reading:

1. Advanced compression techniques
2. Coding Techniques

Course Outcomes:

After completion of the course, Student will be able to

1. Describe various multimedia components
2. Describe compression and decompression techniques
3. Apply the compression concepts in multimedia communication
4. Describe the video encoding
5. To know the digital audio representation

References:

1. Fred Halsall, "Multimedia Communications", Pearson education, 2001

2. J.S. Chitode, **"Information coding techniques"**, Technical publications, 1st edition 2007.
3. Raif steinmetz, Klara Nahrstedt, **"Multimedia: Computing, Communications and Applications"**, Pearson education, 2002
4. John Billamil, Louis Molina, **"Multimedia : An Introduction"**, PHI, 2002

1703EC028	WIRELESS SENSOR NETWORKS	L	T	P	C
		3	0	0	3
	(Common to B.E / B.Tech – CSE, IT & ECE)				

Course Objectives:

1. To study about Wireless networks, protocol stack and standards.
2. To study about fundamentals of 3G Services, its protocols and applications.
3. To study about evolution of 4G Networks, its architecture and applications.

Unit I WIRELESS NETWORK ARCHITECTURE **9 Hours**

Introduction-Wireless network logical architecture – Network physical architecture- Wireless LAN standards: System architecture, protocol architecture, physical layer, MAC layer, 802.11 Enhancements – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth- VoWLAN and VoIP security – WPA- IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX

Unit II ADHOC AND SENSOR NETWORKS **9 Hours**

Introduction – Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6- Mobile ad-hoc network: Routing, Destination Sequence distance vector, Dynamic source routing- Characteristics of MANETs, Table-driven and Source-Initiated On Demand routing protocols, Hybrid protocols, Wireless Sensor networks-Classification, MAC and Routing protocols

Unit III PROTOCOLS AND TCP/IP SUIT **9 Hours**

The Need for a Protocol Architecture - The TCP/IP Protocol Architecture - The OSI Model - Internetworking TCP enhancements for wireless protocols - Traditional TCP: Windows based Congestion control, fast retransmit/fast recovery, Influences of mobility on TCP mechanism - Classical TCP improvements: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, Transaction oriented TCP - TCP over 3G wireless networks

Unit IV DESIGN OF WIRELESS WIDE AREA NETWORK **9 Hours**

Basics of indoor RF planning- Three phases of wireless network design- Overview of UTMS Terrestrial Radio access network-UMTS Core network Architecture: link budgets for GSM, CDMA, 3G-MSC, 3G- SGSN, 3G-GGSN, SMS-GMSC/SMS-IWMSC, Firewall, DNS/DHCP-High speed Downlink packet access (HSDPA)systems - LTE network architecture and protocol

Unit V CURRENT AND FUTURE OF WIRELESS NETWORKING TECHNOLOGY **9 Hours**

Introduction – 4G vision – 4G features and challenges - Applications of 4G – Leading edge WNT: Wireless mesh network routing- Network independent roaming- Gigabit wireless LANs- OFDM-MIMO systems, Adaptive Modulation and coding with time slot scheduler, Cognitive Radio

Total: 45 Hours

Further Reading:

Signal Encoding Techniques, Cordless Systems and Wireless Local Loop
Equalization, Coding, and Diversity, Heterogeneous Wireless Networks

Course Outcomes:

Entrepreneurship

After completion of the course, Student will be able to

1. Conversant with the latest 3G/4G and WiMAX networks and its architecture.
2. Design and implement Routing Techniques
3. Analyze wireless network environment for any application using latest wireless protocols and standards.
4. Compare and Analyze the Different types Networks
5. Implement different type of applications for smart phones and mobile devices with latest network strategies.

References:

1. Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "3G Evolution HSPA and LTE for Mobile Broadband", Second edition, Academic Press, 2008.
2. Anurag Kumar, D.Manjunath, Joy kuri, "Wireless Networking", First Edition, Elsevier 2011.
3. Simon Haykin , Michael Moher, David Koilpillai, "Modern Wireless Communications", First Edition, Pearson Education 2013

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

1703EC029	RADAR AND NAVIGATION AIDS	L	T	P	C
		3	0	0	3

Course Objectives:

1. Able to understand radar equations and types of radar
2. Able to understand aids and navigation systems
3. Obtain the knowledge of Doppler effects and equations nd detect the moving objects

Unit I	RADAR EQUATIONS	9 Hours

RADAR Block Diagram & operation- RADAR Frequencies- RADAR Equation- Detection of signals in Noise- RADAR cross section of targets- RADAR cross section fluctuations- transmitter power- pulse repetition frequency- system losses and propagation effects

Unit II	MTI AND PULSE DOPPLER RADAR	9 Hours

Introduction to Doppler & MTI RADAR- Delay Line canceller- Moving Target Detector- Pulse Doppler RADAR- Non-Coherent MTE- CW RADAR- FMCW RADAR- Tracking RADAR- Monopulse Tracking – Conical Scan and Sequential Lobing.

Unit III	RADAR SIGNAL DETECTION AND PROPAGATION ON WAVES	9 Hours

Detection criteria- automatic detection- constant false alarm rate receiver- information available from a RADAR- ambiguity diagram- pulse compression- introduction to clutter- surface clutter RADAR equation- anomalous propagation and diffraction.

Unit IV	TRACKING , MAGING AND SCANNING RADAR	9 Hours

Tracking with radar ,monopulse tracking ,conical scan and sequential lobing, low angle tracking ,air surveillance radar, Introduction to synthetic aperture radar ,tracking in range and Doppler ,acquisition Principle of phased array for electronic scanning ,and its operation .Radio ranges: LF/MF four course radio ranges ,VHF omni directional range ,vor receiving equipment, Hyperbolic system of navigation :LCRAN,DECCA

Unit V	SATELLITE NAVIGATIONAL SYSTEM	9 Hours

Instrument landing system, Ground controlled approach system, Microwave landing system, Distance measuring equipment ,TACAN Doppler navigation _Doppler effect, Track stabilization .SATELLITE navigation :GPS principle of operation ,position location determination, principle of GPS receiver and applications

	Total:	45 Hours

Further Reading:

GPS principle of operation, Position location determination, principle of GPS receiver and applications

Course Outcomes:

Employability

After completion of the course, Student will be able to

1. Students equipped to find the range and tracking moving object
2. Learn the equations of radar and Doppler effect
3. Study the satellite navigation system
4. Learn the range equation
5. Understand Principles of navigation and landing aids

References:

1. "Introduction to radar system", Merrill I.skolnik ,3rd edition Tata McGraw hill 2003.
2. "Elements electronic navigation system" ,N.S.Nagaraja ,2nd edition Tata McGraw hill 2000.
3. " Principle of Radar" J.C Toomay ,PHI 2nd edition 2004.
4. " Radar Principles ",Peyton Z. Peebles ,John Wiley ,2004.

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

1703EC030	MICROWAVE INTEGRATED CIRCUITS	L	T	P	C
		3	0	0	3

Course Objectives:

1. To enhance the students knowledge in the area of planar microwave engineering and to make them understand the intricacies in the design of microwave circuits.
2. To impart knowledge about the state of art in MIC technology.

Unit I	**INTRODUCTION TO MICROWAVE CIRCUITS**	**9 Hours**
Definitions – Frequency Bands - Lumped versus Distributed Circuits - Behavior of finite length transmission lines – General Characteristics of PC Boards – Transmission Lines on PC Boards – Passives made from Transmission Lines – Resonators - Combiners, Splitters and Couplers		
Unit II	**MATCHING NETWORKS AND FILTER DESIGN**	**9 Hours**
Circuit Representation of two port RF/Microwave Networks: Low Frequency Parameters, High Frequency Parameters, Transmission Matrix, ZY Smith Chart, Design of Matching Circuits using Lumped Elements, Matching Network Design using Distributed Elements, Filter design.		
Unit III	**AMPLIFIERS AND OSCILLATORS**	**9 Hours**
Amplifiers: Stability considerations in active networks – Gain Consideration in Amplifiers – Noise Consideration in active networks – Broadband Amplifier design – Low Noise Amplifier Design, Oscillators: Oscillator versus Amplifier Design - Oscillation conditions – Design and stability considerations of Microwave Transistor Oscillators		
Unit IV	**MIXERS AND CONTROL CIRCUITS**	**9 Hours**
Mixer Types – Conversion Loss – SSB and DSB Mixers – Design of Mixers: Single Ended Mixers – Single Balanced Mixers - Sub Harmonic Diode Mixers , Microwave Diodes , Phase Shifters – PIN Diode Attenuators		
Unit V	**MICROWAVE IC DESIGN AND MEASUREMENT TECHNIQUES**	**12 Hours**
Microwave Integrated Circuits – MIC Materials, Hybrid versus Monolithic MICs – Multichip Module Technology , Fabrication Techniques, Miniaturization techniques, Introduction to SOC, SOP, Test fixture measurements, probe station measurements, thermal and cryogenic measurements, experimental field probing techniques.		
	Total:	**45 + 15 Hours**

Further Reading:

1. Monolithic Microwave Integrated circuit (mmic) technology for space communication applications
2. Integrated Microwave packaging Antenna design

Course Outcomes:

After completion of the course, Student will be able to

1. Equipped from fundamentals to recent techniques in MIC technology.
2. Independently design and assess the performance of various planar configurations.
3. Know measurement techniques
4. Able to design microwave amplifiers and oscillators
5. Able to design lumped and distributed elements.

Entrepreneurship

References:

1. Thomas H.Lee, "Planar Microwave Engineering", Cambridge University Press, 2004.
2. Matthew M. Radmanesh, "Radio Frequency and Microwave Electronics", Pearson Education, II Edition, 2001
3. "Microwave Transistor Amplifiers – Analysis and Design", II Edition, Prentice Hall, New Jersy
4. Ravender Goyal, "Monolithic MIC: Technology & Design", Artech House, 1989.
5. Gupta K.C. and Amarjit Singh, "Microwave Integrated Circuits", John Wiley, New York, 1975.
6. Hoffman R.K., "Handbook of Microwave Integrated Circuits", Artech House, Boston, 198
7. Ulrich L. Rohde and David P. Newkirk, "Microwave Circuit Design for Wireless Applications", John W

Dr. S. RAMABALAN, M.E., Ph.D.
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

1703EC031	SATELLITE COMMUNICATION	L	T	P	C
		3	0	0	3

Course Objectives:

1. To impart knowledge about the Satellite communication.
2. To enhance the students' knowledge in astronomy and space

Unit I	**SATELLITE ORBITS**	**9 Hours**

Introduction - Spectrum allocations for satellite systems -Kepler's Laws - orbital parameters - orbital perturbations - station keeping – Type of orbits - Geo stationary orbits – look angle determination- limits of visibility – eclipse -sub satellite point – sun transit outage - launching procedures - launch vehicles and propulsion.	
Unit II	**SPACE AND EARTH SEGMENT** **9 Hours**
Spacecraft technology- structure- power supply- attitude and orbit control - thermal control and propulsion - communication subsystems - telemetry, tracking and command - TranspondersAntenna subsystem, Equipment reliability. Earth station technology -Receive only home TV systems - MATV – CATV – Transmit Receive Earth Stations.	
Unit III	**SATELLITE ACCESS** **9 Hours**
Modulation and Multiplexing: Voice, Data, Video, Analog - digital transmission system-Digital video broadcast - multiple access: FDMA, TDMA, CDMA - assignment methods -spread spectrum communication -compression – encryption. Mobile satellite Services: GSM, GPS, communication between satellites	
Unit IV	**SATELLITE LINK DESIGN** **9 Hours**
Introduction- Equivalent isotropic radiated power -Transmission Losses – Link power budget equation - System Noise, Carrier to Noise ratio – uplink – downlink – effects of rain – combined uplink and downlink C/N ratio –inter modulation noise - Interference between satellite circuits.	
Unit V	**SATELLITE APPLICATIONS** **12 Hours**
Satellite mobile services – VSAT, Inmarsat- GPS - Globalstar-iridium- Direct Broadcast satellites (DBS) - Direct to home Broadcast (DTH) -Digital audio broadcast (DAB) – World space services, Business TV (BTV) – GRAMSAT - Specialized services: E-mail, Video conferencing, Internet- INTELSAT Series- INSAT – INMARSAT. Remote sensing	
	Total: 45 Hours
Further Reading:	
Latest trend in satellite communication, Recent launching satellites and its application, Communication between satellites, Comparison of satellite	
Course Outcomes:	
After completion of the course, Student will be able to	
1. Discuss orbital mechanics and launch methodologies.	
2. Describe various space subsystems.	
3. Explain different subsystems of earth segment	
4. Design and analyze link power budget for satellites	
5. Describe in various Satellite Applications	
References:	
1. Wilbur L. Pritchard, Henri G. Suyderhoud, Robert A. Nelson, "Satellite Communication Systems Engineering", Prentice Hall/Pearson, 2007	
2. N.Agarwal, "Design of Geosynchronous Space Craft", Prentice Hall, 1986.	
3. Bruce R. Elbert, "The Satellite Communication Applications", Hand Book, Artech House Bostan London, 1997.	
4. Tri T. Ha, "Digital Satellite Communication" II nd edition, 1990.	
5. Emanuel Fthenakis, "Manual of Satellite Communications", Mc Graw Hill Book Co., 1984.	
6. Robert G. Winch, "Telecommunication Trans Mission Systems", Mc Graw-Hill Book Co., 1983	
7. Brian Ackroyd, "World Satellite Communication and earth station Design", BSP professional Books, 1990.	
8. G.B.Bleazard, "Introducing Satellite communications", NCC Publication, 1985.	
9. M.Richharia, "Satellite Communication Systems-Design Principles", Macmillan 2003.	

Professional Electives – VIII

1703EC032	SYSTEM ON CHIP DESIGN	L	T	P	C
		3	0	0	3
Course Objectives:					

	1. To introduce architecture and design concepts underlying system on chips	
	2. To gain knowledge of designing SoCs	
	3. To impart knowledge about the hardware-software design of a modest complexity chip the way from specifications, modeling, synthesis and physical design	
Unit I	**: SYSTEM ARCHITECTURE: OVERVIEW**	**9 Hours**
Components of the system –Processor architectures –Memory and addressing –system level interconnection –SoC design requirements and specifications –design integration –design complexity – cycle time, die area and cost, ideal and practical scaling, area-time-power tradeoff in processor design, Configurability		
Unit II	**PROCESSOR SELECTION FOR SOC**	**9 Hours**
Overview –Soft processors, processor core selection, Basic concepts–instruction set, branches, interrupts and exceptions. Basic elements in instruction handling –Minimizing pipeline delays –reducing the cost of branches –Robust processors –Vector processors, VLIW processors, Superscalar processors.		
Unit III	**MEMORY DESIGN**	**9 Hours**
SoC external memory, SoC internal memory, Scratch pads and cache memory –cache organization and write policies –strategies for line replacement at miss time –split I-and D-caches –multilevel caches –SoC memory systems –board based memory systems –simple processor/memory interaction		
Unit IV	**INTERCONNECT ARCHITECTURES AND SOC CUSTOMIZATION**	**9 Hours**
Bus architectures –SoC standard buses –AMBA, CoreConnect –Processor customization approaches Reconfigurable technologies –mapping designs onto reconfigurable devices -FPGA based design – Architecture of FPGA, FPGA interconnect technology, FPGA memory, Floor plan and routing.		
Unit V	**FPGA BASED EMBEDDED PROCESSOR**	**9 Hours**
Hardware –software task partitioning – FPGA fabric Immersed Processors –Soft Processors and Hard Processors –Tool flow for Hardware/Software Co-design–Interfacing Processor with memory and peripherals – Types of Custom interfaces –Wishbone interface, Avalon Switch Matrix, OPB Bus Interface, Creating a Customized Microcontroller -FPGA-based Signal interfacing and Conditioning		
	Total:	**45 Hours**

Further Readings

1.Modern system design trends
2.MPSoCs design

Employability / Entrepreneurship

Course Outcomes:

After completion of the course, Student will be able to

1.Explain all important components of a System-on-Chip and an embedded system, i.e. digital hardware and embedded software
2.Outline the major design flows for digital hardware and embedded software
3.Discuss the major architectures and trade-offs concerning performance, cost and power consumption of single chip and embedded systems
4.Gain the knowledge of designing SoCs.
5.Understand designing complexity in specification ,Modelling, synthesis and physical design.

References:

1. Michael J. Flynn and Wayne Luk, Computer System Design: System-on-Chip", John Wiley and sons, 2011
2. Rahul Dubey, "Introduction to Embedded System Design Using Field Programmable Gate Arrays", Springer Verlag London Ltd., 2009.
3. Sudeep Pasricha and Nikil Dutt,On-Chip Communication Architectures-System on Chip Interconnect, Elsevier, 2008
4. Wayne Wolf "Modern VLSI Design – System – on – Chip Design", Prentice Hall, 3rd Edition, 2008.
5. Wayne Wolf Modern VLSI Design – IP based Design, Prentice Hall, 4th Edition, 2008.

Dr. S. RAMABALAN, M.E., Ph.D.,
PRINCIPAL
E.G.S. Pillay Engineering College,
Thethi, Nagore - 611 002.
Nagapattinam (Dt) Tamil Nadu.

1703EC033	NETWORK ON CHIP	L	T	P	C
		3	0	0	3

Course Objectives:

1. Understand the various classes of Interconnection networks
2. Learn about different routing techniques for on-chip network
3. Knows the importance of flow control in on-chip network

Unit I	ICN ARCHITECTURE — **9 Hours**

Introduction - Classification of ICNs - Topologies - Direct networks - Indirect networks-Performance analysis

Unit II	SWITCHING TECHNOLOGIES — **9 Hours**

Basic switching techniques - Virtual channels - Hybrid switching techniques Optimizing switching techniques - Comparison of switching techniques - Deadlock, livelock and Starvation

Unit III	ROUTING TECHNOLOGIES — **9 Hours**

Taxonomy of routing algorithms - Deterministic routing algorithms - Partially adaptive algorithms - Fully adaptive algorithms - Routing in MINs - Routing in switch-based networks with irregular topologies - Resource allocation policies Flow control

Unit IV	NETWORK ON CHIP — **9 Hours**

NoC Architectures - Router architecture - Area, energy and reliability constraints - NoC design Iternatives - Quality-of-Service (QoS) issues in NoC architectures

Unit V	EMERGING TRENDS — **9 Hours**

Fault-tolerance issues - Emerging on-chip interconnection technologies- 3D NoC- Simulation

Total:	**45 Hours**

Further Readings

1. Multiprocessor System on chip (MpSOC)
2. NoC in Real time systems (RTS)

Course Outcomes:

After completion of the course, Student will be able to

1. Identify the major components required to design an on-chip network
2. Compare different switching techniques
3. Evaluate the performance of given on chip process
4. Demonstrate the dead lock free and live lock free routing protocols
5. Simulate and assess the performance of given on chip network

References:

1. Jose Duato, Sudhakar Yalamanchili, Lionel Ni, "Interconnection Networks: An Engineering Approach", Morgan Kaufmann, 2002
2. William James Dally, Brian Towles, "Principles and Practices of Interconnection Networks", Morgan Kaufmann, 2004
3. Giovanni De Micheli, Luca Benini, "Networks on Chips: Technology and Tools", Morgan Kaufmann, 2006
4. Natalie D. Enright Jerger, Li-Shiuan Peh, "On-Chip Networks (Synthesis Lectures on Computer Architecture)", Morgan and Claypool, 2001
5. Fayez Gebali, Haytham Elmiligi, Mohamed Watheq El-Kharashi, "Networks-on-Chips: Theory and Practice", CRC Press, 2008

1703EC034	LOW POWER VLSI DESIGN	L	T	P	C
		3	0	0	3

Course Objectives:

1. Identify sources of power in an IC.
2. Identify the power reduction techniques based on technology independent and technology dependent

	Power dissipation mechanism in various MOS logic style.
	Identify suitable techniques to reduce the power dissipation.
	Design memory circuits with low power dissipation.

Unit I	POWER DISSIPATION IN CMOS	**9 Hours**
Hierarchy of limits of power – Sources of power consumption – Physics of power dissipation in CMOS FET devices – Basic principle of low power design.		
Unit II	POWER OPTIMIZATION	**9 Hours**
Logic level power optimization – Circuit level low power design – circuit techniques for reducing power consumption in adders and multipliers.		
Unit III	DESIGN OF LOW POWER CMOS CIRCUITS	**9 Hours**
Computer arithmetic techniques for low power system – reducing power consumption in memories – low power clock, Inter connect and layout design – Advanced techniques – Special techniques.		
Unit IV	POWER ESTIMATION	**9 Hours**
Power Estimation techniques – logic power estimation – Simulation power analysis –Probabilistic power analysis.		
Unit V	SYNTHESIS AND SOFTWARE DESIGN FOR LOW POWER	**9 Hours**
Synthesis for low power – Behavioral level transform – software design for low power.		
	Total:	**45 Hours**

Further Reading:

Dual VDD architecture, High VDD for critical paths and low VDD for non-critical paths.

Course Outcomes:

After completion of the course, Student will be able to

1. Know the basics and advanced techniques in low power design
2. Know the recent trend in power dissipation.
3. Explain the low power CMOS circuits
4. Analyze Power Estimation in low power
5. Synthesis the Low Power Circuits.

References:

1. Gary Yeap, "Practical low power digital VLSI design", Kluwer, 1998.
2. Kaushik Roy and S.C.Prasad, "Low power CMOS VLSI circuit design", Wiley, 2000.
3. DimitrieSoudris, ChristianPignet, Costas Goutis, "Designing CMOS Circuits for Low Power", Kluwer, 2002.
4. J.B.Kuo and J.H.Lou, "Low voltage CMOS VLSI Circuits", Wiley 1999.
5. A.P.Chandrasekaran and R.W.Brodersen, "Low power digital CMOS design", Kluwer,1995.
6. AbdelatifBelaouar, Mohamed I.Elmasry, "Low power digital VLSI design", Kluwer, 1995.
7. James B.Kuo, Shih-Chia Lin, "Low voltage SOI CMOS VLSI devices and Circuits", John Wiley and sons, inc.2001.

1703EC035	ANALOG IC DESIGN	L	T	P	C
		3	0	0	3

Course Objectives:

To impart knowledge about the Analog VLSI Design.

To enhance the students' knowledge in classical VLSI Design

Unit I	MOS DEVICES AND CIRCUITS	**9 Hours**
Evolution of ICs - VLSI design flow - Device modeling -Moore_s law- MOS transistors- depletion and enhancement mode operations - NMOS and CMOS inverter circuits - Stick diagram and Layout diagram- Two input NAND and NOR circuits using CMOS		
Unit II	FABRICATION OF ICS	**9 Hours**

NMOS and CMOS fabrication – N-well, P-well and twin tub processes		
Unit III	IMPLEMENTATION STRATEGIES	9 Hours
PLDs – PAL, PLA, CPLD, Full custom and Semi custom ASIC design- Standard cell design, FPGA building block architectures, FPGA interconnect – Routing – FPGA, Xilinx 4000 series - Altera Cyclone III		
Unit IV	CURRENT TRENDS	9 Hours
BiCMOS and GaAs devices- Introduction to Low power VLSI circuit techniques - Introduction to analog and mixed signal design.		
Unit V	VERILOG HARDWARE DESCRIPTION LANGUAGE	9 Hours
Introduction to Verilog HDL –Behavior modeling –Tasks and functions -Verilog structure, syntax and semantics. Gate level modeling – Dataflow modeling Design examples - Adders, Multiplexers, Flip Flops, Registers, counters		
	Total:	45 Hours
Further Reading:		
Analog Design Essentials		
Stability and Frequency Compensation		
Course Outcomes:		
After completion of this course, Student will be able to		
1. Explain the operation and characteristics of MOS transistor		
2. Discuss the steps involved in fabrication of IC		
3. Outline the role of stick diagram and Layout diagram		
4. Discuss the basic concepts of FPGA and ASIC		
5. Use the Verilog HDL for digital design		
References:		
1. Pucknell D.A and Eshraghian K, "Basic VLSI Design", PHI publication, Second Edition, 2011.		
2. Charles H. Roth, "Digital Systems Design Using VHDL", CL Engineering/Cengage Learning India, 2012.		
3. Samir Palnitkar, "Verilog HDL Guide to Digital design and synthesis", Second Edition Pearson Education, 2006.		
4. M.J. Smith "Application specific integrated circuits", Addison Wesley, 2008.		
5. West N and Eshraghian K, "Principles of CMOS VLSI Design", Addison Wesley Publication, Second Edition, 1993.		

1703EC036	MIXED SIGNAL CMOS DESIGN	L	T	P	C
		3	0	0	3
Course Objectives:	1. To know mixed signal circuits like DAC, ADC, PLL etc. 2. To gain knowledge on filter design in mixed signal mode. 3. To acquire knowledge on design different architectures in mixed signal mode.				
Unit I	CMOS AMPLIFIERS BASICS				9 Hours
Introduction to MOS Capacitances- passive components and their parasitic- small and large signal modelling and analysis- Different Single stage and Differential Amplifiers- Current Mirrors.					
Unit II	MULTI-STAGE AMPLIFIERS				9 Hours
Telescopic and Folded cascode amplifiers- Slew-rate, Pole splitting-Two-stage amplifiers – analysis-Frequency response- Stability compensation- Common mode feedback analysis-feedback amplifier topologies.					
Unit III	CIRCUIT DESIGN				9 Hours
Custom Circuit design-Cell based and Array based design implementations- Static and Dynamic Characteristics of CMOS inverter-Power dissipation-Logical effort- Module 2 Designing combinational and sequential circuits.					