

Dr. Babasaheb Ambedkar Technological University, Lonere.

Dr. Babasaheb Ambedkar Technological University
(Established as a University of Technology in the State of Maharashtra)
(under Maharashtra Act No. XXIX of 2014)
P.O. Lonere, Dist. Raigad, Pin 402 103, Maharashtra
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COURSE STRUCTURE AND SYLLABUS

For

B. Tech. Electronics and Telecommunication Engineering Programme

With effect from the Academic Year

**2017-2018 (First Year), 2018-2019 (Second Year),
2019-2020 (Third Year), 2020-2021 (Final Year).**



Dr. Babasaheb Ambedkar Technological University, Lonere.

B. Tech (Electronics & Telecommunication Engineering)
Proposed Curriculum for Semester VII [Final Year]

Sr. No.	Course Code	Type of Course	Course Title	Hours Per Week			Evaluation Scheme			Total Marks	Credits
				L	T	P	MSE	CA	ESE		
1	BTETC701	Professional Core Course 1	Digital Communication	3	0	0	20	20	60	100	3
2	BTETPE702	Program Elective 3	Group A	3	0	0	20	20	60	100	3
3	BTETPE703	Program Elective 4	Group B	3	0	0	20	20	60	100	3
4	BTETPE704	Program Elective 5	Group C	3	0	0	20	20	60	100	3
5	BTHM705	Humanities & Social Science including Management Courses	Financial Management	2	0	0	20	20	60	100	2
6	BTETL706	Program Elective 3 Lab		0	0	2	--	30	20	50	1
7	BTETL707	Program Elective 4 Lab		0	0	2	--	30	20	50	1
8	BTETL708	Program Elective 5 Lab		0	0	2	--	30	20	50	1
9	BTETP709	Project Part I		0	0	8	--	50	50	100	4
10	BTETF611	Field Training/ Internship/Industrial Training Evaluation		--	--	--	--	--	50	50	1
Total				14	0	14	100	240	460	800	22

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Program Elective - 3 (Group A)	Program Elective -4 (Group B)	Program Elective- 5 (Group C)
(A) Microwave Theory & Techniques	(A) Embedded System Design	(A) Consumer Electronics
(B) RF Circuit Design	(B) Artificial Intelligence Deep learning	(B) Analog Integrated Circuit Design
(C) Satellite Communication	(C) VLSI Design & Technology	(C) Soft Computing
(D) Fiber Optic Communication	(D) Data Compression & Encryption	(D) Advance Industrial Automation-1
(E) Wireless Sensor Networks	(E) Big Data Analytics	(E) Mechatronics
(F) Mobile Computing	(F) Cyber Security	(F) Electronics in Smart City

Dr. Babasaheb Ambedkar Technological University, Lonere.

B. Tech (Electronics & Telecommunication Engineering)

Proposed Curriculum for Semester VIII [Final Year]

(Students doing the Project at Institute Level)

Sr. No.	Course Code	Type of Course	Course Title	Hours Per Week			Evaluation Scheme			Total Marks	Credits
				L	T	P	MSE	CA	ESE		
1	BTETPE801	Program Elective 6	Group A	3	0	0	20	20	60	100	3
2	BTETPE802	Program Elective 7	Group B	3	0	0	20	20	60	100	3
3	BTETOE803	Open Elective 2	Group C	3	0	0	20	20	60	100	3
4	BTETL804	Program Elective 6 Lab		0	0	2	--	30	20	50	1
5	BTETL805	Program Elective 7 Lab		0	0	2	--	30	20	50	1
6	BTETP806	Project Part-II		0	0	16	--	150	100	250	8
Total				9	0	20	60	270	320	650	19

OR

B. Tech (Electronics & Telecommunication Engineering)

Proposed Curriculum for Semester VIII [Final Year]

(Students doing the Project at Industry)

Sr. No.	Course Code	Type of Course	Course Title	Hours Per Week			Evaluation Scheme			Total Marks	Credits
				L	T	P	MSE	CA	ESE		
1	BTETPE801	Program Elective 6	Group A	3	0	0	20	20	60	100	3*
2	BTETPE802	Program Elective 7	Group B	3	0	0	20	20	60	100	3*
3	BTETOE803	Open Elective 2	Group C	3	0	0	20	20	60	100	3*
4	BTETP804	Project Part-II		0	0	20	--	200	150	350	10
Total				9	0	20	60	260	330	650	19

* Students should complete the certification credit course using SWAYAM, MOOC, NPTEL, Coursera platform and submit the certificate. University will transfer these credits accordingly.

OR

B. Tech (Electronics & Telecommunication Engineering)

Proposed Curriculum for Semester VIII [Final Year]

(Students doing the In-plant training and completing the Project sponsored / promoted by Industry)

Sr. No.	Course Code	Type of Course	Course Title	Hours Per Week			Evaluation Scheme			Total Marks	Credits
				L	T	P	MSE	CA	ESE		
1	BTETPE801	Program Elective 6	Group A	--	--	--	--	60*	40*	--	Audit *
2	BTETPE802	Program Elective 7	Group B	--	--	--	--	60*	40*	--	Audit *
3	BTETOE803	Open Elective 2	Group C	--	--	--	--	60*	40*	--	Audit *
4	BTETP804I	In-Plant Training and Project Part-II		--	--	30	--	450	200	--	19
Total				--	--	30	--	450	200	650	19

* Students should complete the certification course using SWAYAM, MOOC, NPTEL Platform or self -study mode.

Program Elective 6 (Group A)	Program Elective 7 (Group B)	Open Elective 2 (Group C)
(A) Entrepreneurship Development	(A) e-Yantra	(A) Advanced Industrial Automation -2
(B) Mixed Signal Design	(B) Mobile Communication & Networks	(B) IoT based Embedded System Design.
(C) Bio-medical Signal Processing	(C) Geo-informatics and Spatial Computing	(C) Industrial Drives and Control
(D) Multirate Digital Signal Processing	(D) Software Defined Radio	(D) Robotics Design
(E) Wavelet Theory	(E) Under Water Signal Processing	(E) Block Chain Technology

Dr. Babasaheb Ambedkar Technological University, Lonere.

2. R. S. Aggarwal, "A modern approach to verbal reasoning", S. Chand publications.
3. Philip Carter, "The Complete Book of Intelligence Test", John Willey & Sons Ltd.
4. Philip Carter, Ken Russell, "Succeed at IQ test", Kogan Page.
5. Eugene Ehrlich, Daniel Murphy, "Schaum's Outline of English Grammar", McGraw Hills.
6. David F. Beer, David A. Mc Murrey, "A Guide to Writing as an Engineer", ISBN: 978-1-118-30027-5 4th Edition, 2014, Wiley.

BTETC701

Digital Communication

3 Credits

Course Objectives:

- To understand the building blocks of digital communication system.
- To prepare mathematical background for communication signal analysis.
- To understand and analyze the signal flow in a digital communication system.
- To analyze error performance of a digital communication system in presence of noise and other interferences.
- To understand concept of spread spectrum communication system.

Course Outcomes:

1. Analyze the performance of a baseband and pass band digital communication system in terms of error rate and spectral efficiency.
2. Perform the time and frequency domain analysis of the signals in a digital communication system.
3. Select the blocks in a design of digital communication system.
4. Analyze Performance of spread spectrum communication system.

UNIT - 1

Digital Transmission of Analog Signal

Introduction to Digital Communication System: Why Digital?, Block Diagram and transformations, Basic Digital Communication Nomenclature. Digital Versus Analog Performance Criteria, Sampling Process, PCM Generation and Reconstruction, Quantization Noise, Non-uniform Quantization and Companding, PCM with noise: Decoding noise, Error

threshold, Delta Modulation, Adaptive Delta Modulation, Delta Sigma Modulation, Differential Pulse Code Modulation, LPC speech synthesis.

UNIT - 2

Baseband Digital Transmission

Digital Multiplexing: Multiplexers and hierarchies, Data Multiplexers. Data formats and their spectra, synchronization: Bit Synchronization, Scramblers, Frame Synchronization. Inter-symbol interference, Equalization.

UNIT - 3

Random Processes

Introduction, Mathematical definition of a random process, Stationary processes, Mean, Correlation & Covariance function, Ergodic processes, Transmission of a random process through a LTI filter, Power spectral density, Gaussian process, noise, Narrow band noise, Representation of narrowband noise in terms of in phase & quadrature components.

UNIT - 4

Baseband Receivers

Detection Theory: MAP, LRT, Minimum Error Test, Error Probability, Signal space representation: Geometric representation of signal, Conversion of continuous AWGN channel to vector channel, Likelihood functions, Coherent Detection of binary signals in presence of noise, Optimum Filter, Matched Filter, Probability of Error of Matched Filter, Correlation receiver.

UNIT - 5

Passband Digital Transmission

Pass band transmission model, Signal space diagram, Generation and detection, Error Probability derivation and Power spectra of coherent BPSK, BFSK and QPSK. Geometric representation, Generation and detection of - M-ary PSK, M-ary QAM and their error probability, Generation and detection of -Minimum Shift Keying, Gaussian MSK, Non-coherent BFSK, DPSK and DE PSK ,Introduction to OFDM.

UNIT - 6

Spread Spectrum Techniques

Introduction, Pseudo noise sequences, A notion of spread spectrum, Direct sequence spread spectrum with coherent BPSK, Signal space dimensionality & processing gain, Probability of error, Concept of jamming, Frequency hop spread spectrum, Wireless Telephone Systems, Personal Communication System.

TEXT/REFERENCE BOOKS

1. Simon Haykin, "Digital Communication Systems", John Wiley & Sons, Fourth Edition.
2. A.B Carlson, P B Crully, J C Rutledge, "Communication Systems", Fourth Edition, McGraw Hill Publication.
3. Ha Nguyen, Ed Shwedyk, "A First Course in Digital Communication", Cambridge University Press.
4. B P Lathi, Zhi Ding "Modern Analog and Digital Communication System", Oxford University Press, Fourth Edition.
5. Bernard Sklar, Prabitra Kumar Ray, "Digital Communications Fundamentals and Applications" Second Edition, Pearson Education.
6. Taub, Schilling, "Principles of Communication System", Fourth Edition, McGraw Hill.
7. P Ramkrishna Rao, Digital Communication, Mc Graw Hill Publication.

BTETPE702A

Microwave Theory and Techniques

3 Credits

Course Objectives:

- To lay the foundation for microwave engineering.
- To understand the applications of microwave engineering.
- Carryout the microwave network analysis.

Course Outcomes:

After successfully completing the course students will be able to

1. Formulate the wave equation in wave guide for analysis.
2. Identify the use of microwave components and devices in microwave applications.
3. Understand the working principles of all the microwave tubes.

4. Understand the working principles of all the solid state devices.
5. Choose a suitable microwave tube and solid state device for a particular application.
6. Carry out the microwave network analysis.
7. Choose a suitable microwave measurement instruments and carry out the required measurements.

UNIT - 1

Transmission Lines and Waveguides:

Introduction to Microwaves engineering: History of Microwaves, Microwave Frequency bands. Applications of Microwave, General solution for TEM, TE and TM waves, Parallel plate waveguide, and rectangular waveguide, Wave guide parameters, Introduction to coaxial line, Rectangular waveguide cavity resonators, Circular waveguide cavity resonators.

UNIT - 2

Microwave Components:

Multi-port junctions: Construction and operation of E-plane, H-plane, Magic Tee and Directional couplers. Ferrites components: - Ferrite Composition and characteristics, Faraday rotation, Construction and operation of Gyrator, Isolator and Circulator.

Striplines: Structural details and applications of Striplines, Microstrip line, Parallel Strip line, Coplanar Strip line, Shielded Strip Line.

UNIT - 3

Microwave Network Analysis

Introduction and applications of Impedance and Equivalent voltages and currents, Impedance and Admittance matrices, The Transmission (ABCD) matrix Scattering Matrix:- Significance, formulation and properties. S-Matrix calculations for-2 port network junction, E plane, H-plane and E-H (Magic Tee) Tees, Directional coupler, Isolator and Circulator. Related problems.

UNIT - 4

Microwave Tubes

Limitations of conventional tubes, O and M type classification of microwave tubes, reentrant cavity, velocity modulation. O type tubes Two cavity Klystron: Construction and

principle of operation, velocity modulation and bunching process Applegate diagram. Reflex Klystron: Construction and principle of operation, velocity modulation and bunching process, Applegate diagram, Oscillating modes, o/p characteristics, efficiency, electronic & mechanical tuning. M-type tubes Magnetron: Construction and Principle of operation of 8 cavity cylindrical travelling wave magnetron, hull cutoff condition, modes of resonance, PI mode operation, o/p characteristics, Applications. Slow wave devices Advantages of slow wave devices, Helix TWT: Construction and principle of operation, Applications.

UNIT - 5

Microwave bipolar transistor, FET, MESFET, Varactor Diode, PIN Diode, Schottky Barrier Diode, Tunnel Diode, TEDs, Gunn Diodes, IMPATT diode and TRAPATT diode. Structural details, Principle of operation, various modes, specifications, and applications of all these devices.

UNIT - 6

Microwave Measurements

Measurement devices: Slotted line, Tunable detector, VSWR meter, Power Meter, S-parameter measurement, frequency measurements, Power measurement, Attenuation measurement, Phase shift measurement, VSWR measurement, Impedance measurement, Q of cavity resonator measurement.

TEXT/REFERENCE BOOKS

1. Microwave Engineering – Annapurna Das, Sisir K Das TMH Publication, 2nd, 2010
2. Microwave Devices and circuits- Liao / Pearson Education
3. Antennas and Wave Propagation, John D. Krauss, Ronald J Marhefka and Ahmad S Khan, 4th Special Indian Edition , McGraw- Hill Education Pvt. Ltd., 2010.
4. Microwave Engineering – David M Pozar, John Wiley India Pvt. Ltd., 3rd Edn, 2008
5. Microwave Engineering – Sushrut Das, Oxford Higher Education, 2nd Edn, 2015
6. Antennas and Wave Propagation – Harish and Sachidananda: Oxford University Press, 2007.

BTETPE702B

RF Circuit Design

3 Credits

Course Objectives:

- To study RF issues related to active and passive components.
- To study circuit design aspects at RF
- To learn design and modeling of circuits at RF.

Course Outcomes:

After successfully completion of the course students will be able to

1. Understand behavior of passive components at high frequency and modeling of HF circuit.
2. Design HF amplifiers with gain bandwidth parameters.
3. Understand Mixer types and characteristics.
4. Gain the knowledge about PLLs and Oscillators with respect to their circuit topologies.

UNIT - 1

RF Behavior of Passive Components

HF Resistors, HF Capacitors, HF Inductors, Chip Components. Circuit Board Considerations: Chip Resistors, Chip Capacitors, Surface Mounted Inductors.

UNIT - 2

Bandwidth Estimation

Open Circuit Time Constant Method: Observations & Interpretations, Accuracy of OC τ s, Considerations, and Design examples. Short Circuit Time Constant Method: Background, Observations & Interpretations, Considerations. Delay of a system in cascade, Rise time of systems in cascade, Relation between Rise Time and Bandwidth.

UNIT - 3

High Frequency Amplifier Design

Shunt Peaked Amplifier, Shunt Series peak Amplifier, Two port bandwidth enhancement, Design example. Bandwidth enhancement techniques. Tuned Amplifier: Common Source Amplifier with Single Tuned Load, Analysis of Tuned Amplifier. Neutralization and unilateralization. Characteristics of RF amplifier. Amplifier power relations. Stability considerations, Stabilization methods.

UNIT - 4

Low Noise Amplifier Design

MOSFET two port noise parameters, LNA topologies, Power-constrained noise optimization. Design examples: Single ended LNA, Differential LNA. Linearity and large signal performance. Spurious free dynamic range.

UNIT - 5

Oscillators

Problem with Purely Linear Oscillators, Describing Functions, Describing Function for MOS. Colpitts Oscillator: Describing Function Model and Start-up Model of Colpitts Oscillator. Resonators: Quarter-Wave Resonators, Quartz Crystals. Tuned Oscillators: Basic LC Feedback Oscillators, Crystal Oscillator. Negative Resistance Oscillator.

UNIT - 6

Mixers

Mixer Fundamentals. Significant Characteristics of Mixer: Conversion Gain, Noise Figure, Linearity and Isolation, Spurs. Non Linear Systems as Linear Mixers. Multiplier Based Mixers: Single Balanced Mixer, Linearization techniques of Mixer, Active Double Balanced Mixer. Passive Double Balanced Mixer, Diode Ring Mixers.

TEXT/REFERENCE BOOKS

1. Reinhold Ludwig, Pavel Bretchko, "RF Circuit Design Theory and Applications", Pearson Education.
2. Thomas H. Lee, "The Design of CMOS Radio-Frequency Integrated Circuits", Second Edition, Cambridge Publications.
3. T. Yettrdal, Yunhg Cheng, "Devices modeling for analog and RF COMS circuits design", John Wiley publication.
4. Calvin Plett, "Radio frequency Integrated Circuits Design", Artech house.

Course Objectives:

- To provide students with good depth of knowledge in radar and Satellite communication.
- Knowledge of theory and practice of advanced communication techniques e.g. TDMA, CDMA, FDMA.
- This will equip the students for further studies and research knowledge of modern applications in radar and Satellite communication.

Course Outcomes:

At the end of the course, the students will have:

1. Knowledge of theory and practice related to radar and Satellite communication.
2. Ability to identify, formulate and solve engineering problems related to radar and Satellite communication.
3. The student would be able to analyze the various aspects of establishing a geo-stationary satellite communication link.
4. Acquired knowledge about Satellite Navigation System.
5. Acquired knowledge about Radar and Radar Equations.

UNIT - 1

Basic Principles

General features, frequency allocation for satellite services, properties of satellite communication systems.

Earth Station: Introduction, earth station subsystem, different types of earth stations.

UNIT - 2

Satellite Orbits

Introduction, Kepler's laws, orbital dynamics, orbital characteristics, satellite spacing and orbital capacity, angle of elevation, eclipses, launching and positioning, satellite drift and station keeping.

UNIT - 3

Satellite Construction (Space Segment)

Introduction; attitude and orbit control system; telemetry, tracking and command; power systems, communication subsystems, antenna subsystem, equipment reliability and space qualification.

UNIT - 4

Satellite Links

Introduction, general link design equation, system noise temperature, uplink design, downlink design, complete link design, effects of rain.

UNIT - 5

The Space Segment Access and Utilization

Introduction, space segment access methods: TDMA, FDMA, CDMA, SDMA, assignment methods.

UNIT - 6

The Role and Application of Satellite Communication

Introduction to Digital Satellite and Mobile Satellite Communication.

TEXT/REFERENCE BOOKS

1. Timothy Pratt, Charles W. Bostian, Satellite Communications, John Wiley & Sons.
2. Dennis Roddy, Satellite Communications, 3rd Ed., McGraw-Hill International Ed. 2001.
3. W. L. Pritchard, J. A. Sciulli, Satellite Communication Systems Engineering, Prentice-Hall, Inc., NJ.
4. M. O. Kolawole, Satellite Communication Engineering, Marcel Dekker, Inc. NY.
5. Robert Gagliardi , "Satellite Communication" , CBS Publication.
6. Ha, "Digital Satellite Communication", McGraw- Hill.
7. Timothy Pratt and Charles Bostian, "Satellite Communications", John Wiley and Sons.

Course Objectives:

- To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.
- To understand the different kind of losses, signal distortion in optical wave guides and other signal degradation factors.
- To learn the various optical source materials, LED structures, quantum efficiency, Laser diodes
- Understand the functionality of each of the components that comprise a fiber-optic communication system: transmitter, fiber, amplifier, and receiver.
- Understand the properties of optical fiber that affect the performance of a communication link.
- Understand basic optical amplifier operation and its effect on signal power and noise in the system.
- Apply concepts listed above to the design of a basic communication link.

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Understand the principles fiber-optic communication, the components and the bandwidth advantages.
2. Understand the properties of the optical fibers and optical components.
3. Understand operation of lasers, LEDs, and detectors.
4. Analyze system performance of optical communication systems.
5. Design optical networks and understand non-linear effects in optical fibers

UNIT - 1

Introduction

Introduction to vector nature of light, propagation of light, propagation of light in a cylindrical dielectric rod, Ray model, wave model.

UNIT - 2

Types of optical fibers

Different types of optical fibers, Modal analysis of a step index fiber, Signal degradation on optical fiber due to dispersion and attenuation. Fabrication of fibers and measurement techniques like OTDR.

UNIT - 3

Optical sources

LEDs and Lasers, Photo-detectors - pin-diodes, APDs, detector responsivity, noise, optical receivers. Optical link design - BER calculation, quantum limit, power penalties

UNIT - 4

Optical switches

Coupled mode analysis of directional couplers, electro-optic switches.

UNIT - 5

Optical amplifiers

EDFA, Raman amplifier, WDM and DWDM systems, Principles of WDM networks.

UNIT - 6

Nonlinear effects in fiber optic links

Nonlinear effects in fiber optic links, Concept of self-phase modulation, group velocity dispersion and soliton based communication.

TEXT/REFERENCE BOOKS

1. J. Keiser, Fibre Optic communication, McGraw-Hill, 5th Ed. 2013 (Indian Edition).
2. T. Tamir, Integrated optics, (Topics in Applied Physics Vol.7), Springer-Verlag, 1975.
3. J. Gowar, Optical communication systems, Prentice Hall India, 1987.
4. S.E. Miller and A.G. Chynoweth, eds., Optical fibres telecommunications, Academic Press, 1979.
5. G. Agrawal, Nonlinear fibre optics, Academic Press, 2nd Ed. 1994.
6. G. Agrawal, Fiber optic Communication Systems, John Wiley and sons, New York, 1997

7. F.C. Allard, Fiber Optics Handbook for engineers and scientists, McGraw Hill, New York (1990).

BTETPE702E

Wireless Sensor Networks

3 Credits

Course Objectives:

- To introduce the emerging research areas in the field of wireless sensor networks
- To understand different protocols and their uses in WSN.

Course Outcomes:

At the end of the course the students will be able to

1. Design wireless sensor networks for a given application
2. Understand emerging research areas in the field of sensor networks
3. Understand MAC protocols used for different communication standards used in WSN
4. Explore new protocols for WSN.

UNIT - 1

Introduction

Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Types of wireless sensor networks

UNIT - 2

Networks

Mobile Ad-hoc Networks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks. Issues and challenges in wireless sensor networks.

UNIT - 3

Protocols

Routing protocols, MAC protocols: Classification of MAC Protocols, S-MAC Protocol, B-MAC protocol, IEEE 802.15.4 standard and ZigBee.

UNIT - 4

Dissemination protocol

Dissemination protocol for large sensor network, Data dissemination, data gathering, and data fusion; Quality of a sensor network; Real-time traffic support and security protocols.

UNIT - 5

Design Principles for WSNs, Gateway Concepts Need for gateway, WSN to Internet Communication, and Internet to WSN Communication.

UNIT - 6

Single-node architecture, Hardware components & design constraints, Operating systems and execution environments.

TEXT/REFERENCE BOOKS

1. Walteneus Dargie , Christian Poellabauer, “ Fundamentals Of Wireless Sensor Networks Theory And Practice” , By John Wiley & Sons Publications ,2011
2. Sabrie Soloman, “Sensors Handbook" by McGraw Hill publication. 2009
3. Feng Zhao, Leonidas Guibas, “ Wireless Sensor Networks” , Elsevier Publications,2004
4. Kazem Sohrby, Daniel Minoli, “Wireless Sensor Networks”: Technology, Protocols and Applications, Wiley-Inter science
5. Philip Levis, And David Gay "Tiny OS Programming” by Cambridge University Press 2009.

BTETPE702F

Mobile Computing

3 Credits

Course Objectives:

- To provide guidelines, design principles and experience in developing applications for small, mobile devices, including an appreciation of context and location aware services.
- To introduce wireless communication and networking principles, that support connectivity to cellular networks, wireless internet and sensor devices.
- To appreciate the social and ethical issues of mobile computing, including privacy.

Course Outcomes:

1. At the end of the course, the student will be able to demonstrate:
2. A working understanding of the characteristics and limitations of mobile hardware devices including their user-interface modalities
3. The ability to develop applications that are mobile-device specific and demonstrate current practice in mobile computing contexts.

4. A comprehension and appreciation of the design and development of context-aware solutions for mobile devices.
5. An awareness of professional and ethical issues, in particular those relating to security and privacy of user data and user behavior.

UNIT - 1

Mobile Computing, Mobile Computing vs. wireless Networking, Mobile Computing Applications, Characteristics of Mobile computing, Structure of Mobile Computing Application.

UNIT - 2

MAC Protocols, Wireless MAC Issues, Fixed Assignment Schemes, Random Assignment Schemes, Reservation Based Schemes.

UNIT - 3

Overview of Mobile IP, Features of Mobile IP, Key Mechanism in Mobile IP, route Optimization. Overview of TCP/IP, Architecture of TCP/IP- Adaptation of TCP Window, Improvement in TCP Performance.

UNIT - 4

Global System for Mobile Communication (GSM), General Packet Radio Service (GPRS), Universal Mobile Telecommunication System (UMTS).

UNIT - 5

Ad-Hoc Basic Concepts , Characteristics , Applications , Design Issues , Routing , Essential of Traditional Routing Protocols ,Popular Routing Protocols , Vehicular Ad Hoc networks (VANET) , MANET vs. VANET , Security.

UNIT - 6

Mobile Device Operating Systems , Special Constrains & Requirements , Commercial Mobile Operating Systems , Software Development Kit: iOS, Android, BlackBerry, Windows Phone , M Commerce , Structure , Pros & Cons , Mobile Payment System , Security Issues.

TEXT/REFERENCE BOOKS

1. Principles of Mobile Computing, 2nd Edition, Uwe Hansmann, Lothar Merk, Martin Nicklous, Thomas Stober, Springer

2. Mobile Computing, Tomasz Imielinski, Springer.

BTETPE703A

Embedded System Design

3 Credits

Course Objectives:

- To understand the embedded system design issues.
- To learn real time operating system concepts.
- To understand the Embedded Linux environment.
- To learn embedded software development and testing process.

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Suggest design approach using advanced controllers to real-life situations.
2. Design interfacing of the systems with other data handling / processing systems.
3. Appreciate engineering constraints like energy dissipation, data exchange speeds etc.
4. Get to know the hardware – software co design issues and testing methodology for embedded system.

UNIT - 1

Introduction to Embedded Computing

The concept of embedded systems design, Characteristics of Embedding Computing Applications, Concept of Real time Systems

UNIT - 2

Design Process

Requirements, Specifications, Architecture Design, Designing of Components, Embedded microcontroller cores, embedded memories. Examples of embedded systems

UNIT - 3

Technological aspects of embedded systems

Interfacing between analog and digital blocks, signal conditioning, digital signal processing, subsystem interfacing, interfacing with external systems, user interfacing.

UNIT - 4

Design tradeoffs

Design tradeoffs due to process compatibility, thermal considerations, etc., Software aspects of embedded systems: real time programming languages and operating systems for embedded systems

UNIT - 5

Operating System

Basic Features of an Operating System, Kernel Features: Real-time Kernels, Polled Loops System, Co-routines, Interrupt-driven System, Multi-rate System Processes and Threads, Context Switching: Cooperative Multi-tasking, Pre-emptive Multi- tasking.

UNIT - 6

Scheduling and Inter-process Communication

Rate-Monotonic Scheduling, Earliest-Deadline First Scheduling, Task Assignment, Fault-Tolerant Scheduling Signals, Shared Memory Communication, Message-Based Communication

TEXT/REFERENCE BOOKS

1. J.W. Valvano, "Embedded Microcomputer System: Real Time Interfacing", Brooks/Cole, 2000.
2. Jack Ganssle, "The Art of Designing Embedded Systems", Newness, 1999.
3. V.K. Madiseti, "VLSI Digital Signal Processing", IEEE Press (NY, USA), 1995.
4. David Simon, "An Embedded Software Primer", Addison Wesley, 2000.
5. K.J. Ayala, "The 8051 Microcontroller: Architecture, Programming, and Applications", Penram Intl, 1996.

BTETPE703B

Artificial Intelligence Deep Learning

3 Credits

Course Objectives:

- Apply AI techniques to solve the given problems.
- Implement trivial AI techniques on relatively large system
- Explain uncertainty and Problem solving techniques.
- Compare various learning techniques.

Course Outcomes:

This course will enable students to

1. Identify the AI based problems.
2. Apply techniques to solve the AI problems.
3. Define learning and explain various logic inferences.
4. Discuss different learning techniques.

UNIT - 1

Introduction:

What Is AI? Thinking humanly: The cognitive modeling approach. Thinking rationally: The “laws of thought” approach, Acting rationally: The rational agent approach. The Foundations of Artificial Intelligence, Mathematics, Economics, Neuroscience, Computer engineering, The History of Artificial Intelligence. AI becomes an industry (1980-- present). Agents and Environments, Good Behaviour: The Concept of Rationality. The Nature of Environments. The Structure of Agents.

UNIT - 2

Search Techniques:

Problem-Solving Agents, Well-defined problems and solutions, Formulating problems, Real-world problems. Uninformed Search Strategies, Breadth-first search, Uniform-cost search, Depth-first search, Depth-limited search, Iterative deepening depth-first search, Bidirectional search, Informed (Heuristic) Search Strategies, Greedy best-first search, A* search: Minimizing the total estimated solution cost, Heuristic Functions. The effect of heuristic accuracy on performance. Beyond Classical Search, Local Search Algorithms and Optimization Problems, Local Search in Continuous Spaces.

UNIT - 3

Game Playing:

Games, Optimal Decisions in Games, The minimax algorithm, Optimal decisions in multiplayer games, Alpha Beta Pruning, Move ordering, Imperfect Real-Time Decisions, Cutting off search, Forward pruning, Stochastic Games, Evaluation functions for games of chance, Partially Observable Games, Krieg spiel: Partially observable chess, Card games, State-of-the-Art Game Programs, Alternative Approaches.

UNIT - 4

Logic and inference:

Defining Constraint Satisfaction Problems, Constraint Propagation: Inference in CSPs, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems, Knowledge-Based Agents, The Wumpus World, Logic , Propositional Logic: A Very Simple Logic, Propositional Theorem Proving, Effective Propositional Model Checking, Agents Based on Propositional Logic. Forward Chaining, Backward Chaining, Definition of Classical Planning. Algorithms for Planning as State-Space Search, Planning Graphs.

UNIT - 5

Learning:

Forms of Learning, Supervised Learning, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, Model selection: Complexity versus goodness of fit, From error rates to loss, Regularization, The Theory of Learning, Regression and Classification with Linear Models, Artificial Neural Networks, Nonparametric Models, Ensemble Learning, Online Learning, Practical Machine Learning, A Logical Formulation of Learning. Knowledge in Learning. Explanation-Based Learning, Learning Using Relevance Information. Inductive Logic Programming. Statistical Learning. Learning with Complete Data. Learning with Hidden Variables: The EM Algorithm.

TEXT/REFERENCE BOOKS

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach. III Edition
2. E. Rich, K. Knight & S. B. Nair - Artificial Intelligence, 3/e, McGraw Hill.
3. Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems, Prentice Hall of India.
4. G. Luger, “Artificial Intelligence: Structures and Strategies for complex problem Solving”, Fourth Edition, Pearson Education, 2002.
5. N.P. Padhy “Artificial Intelligence and Intelligent Systems” , Oxford University Press- 2015.

Course Objectives:

- To study HDL based design approach.
- To learn digital CMOS logic design.
- To nurture students with CMOS analog circuit designs.
- To realize importance of testability in logic circuit design.
- To overview SoC issues and understand PLD architectures with advanced features.

Course Outcomes:

After successfully completing the course, students will be able to

1. Model digital circuit with HDL, simulate, synthesis and prototype in PLDs.
2. Understand chip level issues and need of testability.
3. Design analog & digital CMOS circuits for specified applications

UNIT - 1

VHDL Modeling

Data objects, Data types, Entity, Architecture & types of modeling, Sequential statements, Concurrent statements, Packages, Sub programs, Attributes, VHDL Test bench, Test benches using text files. VHDL modeling of Combinational, Sequential logics & FSM, Meta-stability.

UNIT - 2

PLD Architectures

PROM, PLA, PAL: Architectures and applications. Software Design Flow, CPLD Architecture, Features, Specifications, Applications, FPGA Architecture, Features, Specifications, Applications.

UNIT - 3

SoC & Interconnect

Clock skew, Clock distribution techniques, clock jitter, Supply and ground bounce, power distribution techniques. Power optimization, Interconnect routing techniques; wire parasitic, Signal integrity issues, I/O architecture, pad design, Architectures for low power.

UNIT - 4

Digital CMOS Circuits

MOS Capacitor, MOS Transistor theory, C-V characteristics, Non ideal I-V effects, Technology Scaling. CMOS inverters, DC transfer characteristics, Power components, Power delay product, Transmission gate. CMOS combo logic design, Delays: RC delay model, Effective resistance, Gate and diffusion capacitance, Equivalent RC circuits; Linear delay model, Logical effort, Parasitic delay, Delay in a logic gate, Path logical efforts.

UNIT - 5

Analog CMOS Design

Current sink and source, Current mirror, Active load, Current source and Push-pull inverters, Common source, Common drain, Common gate amplifiers. Cascade amplifier, Differential amplifier, Operational amplifier

UNIT - 6

Testability

Types of fault, Need of Design for Testability (DFT), Testability, Fault models, Path sensitizing, Sequential circuit test, BIST, Test pattern generation, JTAG & Boundary scan, TAP Controller.

TEXT/REFERENCE BOOKS

1. Charles H. Roth, "Digital systems design using VHDL", PWS.
2. Wyane Wolf, "Modern VLSI Design (System on Chip)", PHI Publication.
3. Allen Holberg, "Analog CMOS Design", Oxford University Press.
4. Neil H. E. Weste, David Money Harris, "CMOS VLSI Design: A Circuit & System Perspective", Pearson Publication.

BTETPE703D

Data Compression & Encryption

3 Credits

Course Objectives:

- The concept of security, types of attack experienced.
- Encryption and authentication for deal with attacks, what is data compression, need and techniques of data compression.

Course Outcomes:

At the end of this course

1. The student will have the knowledge of Plaintext, cipher text, RSA and other cryptographic algorithm.
2. The student will have the knowledge of Key Distribution, Communication Model, Various models for data compression.

UNIT - 1

Data Compression and Encryption:

Need for data compression, Lossy/lossless compression, symmetrical compression and compression ratio, run length encoding for text and image compression, relative encoding and its applications in facsimile data compression and telemetry, scalar and quantization.

UNIT - 2

Statistical Methods:

Statistical modeling of information source, coding redundancy, variable size codes, prefix codes, Shannon- Fano coding, Huffman coding, adaptive Huffman coding, arithmetic coding and adaptive arithmetic coding, text compression using PPM method.

UNIT - 3

Dictionary Methods:

String compression, sliding window compression, LZ77, LZ78 and LZW algorithms and applications in text compression, zip and Gzip, ARC and Redundancy code.

UNIT - 4

Image Compression:

Lossless techniques of image compression, gray codes, two dimensional image transform ,Discrete cosine transform and its application in lossy image compression, quantization, Zig-Zag coding sequences, JPEG and JPEG-LS compression standards, pulse code modulation

and differential pulse code modulation methods of image compression, video compression and MPEG industry standard.

UNIT - 5

Audio Compression:

Digital audio, lossy sound compression, M-law and A-law companding, DPCM and ADPCM audio compression, MPEG audio standard, frequency domain coding, format of compressed data.

UNIT - 6

Conventional Encryption:

Security of information, security attacks, classical techniques, caesar Cipher, block cipher principles, data encryption standard, key generation for DES, block cipher principle, design and modes of operation, S-box design, triple DES with two three keys, introduction to international data encryption algorithm, key distribution.

TEXT/REFERENCE BOOKS

1. Data compression- David Solomon Springer Verlag publication.
2. Cryptography and network security- William Stallings Pearson Education Asia Publication.
3. Introduction to data compression-Khalid Sayood Morgan kaufmann publication.
4. The data compression book- Mark Nelson BPB publication.
5. Applied cryptography-Bruce Schneier, John Wiley and sons Inc., publications.

BTETPE703E

Big Data Analytics

3 Credits

Course Objectives:

- To provide an overview of an exciting growing field of Big Data analytics.
- To discuss the challenges traditional data mining algorithms face when analyzing Big Data.
- To introduce the tools required to manage and analyze big data like Hadoop, NoSql Map Reduce.

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- To teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability
- To introduce to the students several types of big data like social media, web graphs and data streams
- To enable students to have skills that will help them to solve complex real-world problems in for decision support.

Course Outcomes:

At the end of this course, Students will able to:

1. Explain the motivation for big data systems and identify the main sources of Big Data in the real world.
2. Demonstrate an ability to use frameworks like Hadoop, NOSQL to efficiently store retrieve and process Big Data for Analytics.
3. Implement several Data Intensive tasks using the Map Reduce Paradigm
4. Apply several newer algorithms for Clustering Classifying and finding associations in Big Data.

UNIT - 1

Big Data Platforms

Big Data Platforms for the Internet of Things: network protocol- data dissemination –current state of art- Improving Data and Service Interoperability with Structure, Compliance, Conformance and Context Awareness: interoperability problem in the IoT context- Big Data Management Systems for the Exploitation of Pervasive Environments - Big Data challenges and requirements.

UNIT - 2

YA TRAP – Necessary and sufficient condition for false authentication prevention - Adaptive Pipelined Neural Network Structure in Self-aware Internet of Things: self-healing systems Role of adaptive neural network- Spatial Dimensions of Big Data: Application of Geographical Concepts and Spatial Technology to the Internet of Things- Applying spatial relationships, functions, and models.

UNIT - 3

Fog Computing

Fog Computing: A Platform for Internet of Things and Analytics: a massively distributed number of sources - Big Data Metadata Management in Smart Grids: semantic inconsistencies - role of metadata.

UNIT - 4

Web Enhanced Building

Toward Web Enhanced Building Automation Systems: heterogeneity between existing installations and native IP devices - loosely-coupled Web protocol stack –energy saving in smart building- Intelligent Transportation Systems and Wireless Access in Vehicular Environment Technology for Developing Smart Cities: advantages and achievements.

UNIT - 5

Technologies for Healthcare

Emerging Technologies in Health Information Systems: Genomics Driven Wellness Tracking and Management System (GO-WELL) – predictive care – personalized medicine.

UNIT - 6

Sustainability Data and Analytics

Sustainability Data and Analytics in Cloud-Based M2M Systems - potential stakeholders and their complex relationships to data and analytics applications - Social Networking Analysis - Building a useful understanding of a social network - Leveraging Social Media and IoT to Bootstrap Smart Environments: lightweight Cyber Physical Social Systems - citizen actuation.

TEXT/REFERENCE BOOKS

1. Stackowiak, R., Licht, A., Mantha, V., Nagode, L.,” Big Data and the Internet of Things Enterprise Information Architecture for A New Age”, Apress, 2015. 2. Dr. John Bates, “Thingalytics - Smart Big Data Analytics for the Internet of Things”, john Bates, 2015.
2. Dr. John Bates, “Thingalytics - Smart Big Data Analytics for the Internet of Things”, john Bates, 2015.

BTETPE703F

Cyber Security

3 Credits

Course Objectives:

- For secured and under control since the information stored and conveyed is ultimately an invaluable resource of the business.
- The growing number of the computer Network(internet/intranet) attacks and sophistication in attack technologies has made this task still more complicated
- To update the knowledge of the personnel manning networks and systems on the network security issues and solutions.

Course Outcomes:

Students should be able to understand.

1. The difference between threat, risk, attack and vulnerability.
2. How threats materialize into attacks.
3. Where to find information about threats, vulnerabilities and attacks.
4. Typical threats, attacks and exploits and the motivations behind them.

UNIT - 1

Introduction to Cyber Security

Overview of Cyber Security, Internet Governance – Challenges and Constraints, Cyber Threats – Cyber Warfare-Cyber Crime-Cyber terrorism-Cyber Espionage, Need for a Comprehensive Cyber Security Policy, Need for a Nodal Authority, Need for an International convention on Cyberspace.

UNIT - 2

Cyber Security Vulnerabilities and Cyber Security Safeguards

Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Ethical Hacking, Firewalls, Intrusion Detection Systems, Response, Scanning, Security policy, Threat Management.

UNIT - 3

Securing Web Application, Services and Servers

Introduction, Basic security for HTTP Applications and Services, Basic Security for SOAP Services, Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges.

UNIT - 4

Intrusion Detection and Prevention

Intrusion, Physical Theft, Abuse of Privileges, Unauthorized Access by Outsider, Malware infection, Intrusion detection and Prevention Techniques, Anti-Malware software, Network based Intrusion detection Systems, Network based Intrusion Prevention Systems, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, System Integrity Validation.

UNIT - 5

Cryptography and Network Security

Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography. Overview of Firewalls- Types of Firewalls, User Management, VPN Security Security Protocols: - security at the Application Layer- PGP and S/MIME, Security at Transport Layer- SSL and TLS, Security at Network Layer-IPSec.

UNIT - 6

Cyberspace and the Law, Cyber Forensics

Introduction, Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, National Cyber Security Policy 2013 Introduction to Cyber Forensics, Handling Preliminary Investigations, Controlling an Investigation, Conducting disk-based analysis, Investigating Information-hiding, Scrutinizing E-mail, Validating E-mail header information, Tracing Internet access, Tracing memory in real-time.

TEXT/REFERENCE BOOKS

1. Charles P. Pfleeger Shari Lawrence Pfleeger Jonathan Margulies, Security in Computing, 5th Edition , Pearson Education , 2015

2. George K.Kostopoulos, Cyber Space and Cyber Security, CRC Press, 2013.
3. Martti Lehto, Pekka Neittaanmäki, Cyber Security: Analytics, Technology and Automation edited, Springer International Publishing Switzerland 2015.
1. Nelson Phillips and Einfinger Steuart, —Computer Forensics and Investigations, Cengage Learning, New Delhi, 2009.

BTETPE704A

Consumer Electronics

3 Credits

Course Objectives:

- To acquaint students with the practical knowledge of designing and developing consumer electronic systems and products and introduce the latest trends and technologies.

Course Outcomes:

Students will be able to:

1. List technical specification of electronics Audio system (microphone and speaker)
2. Trouble shoots consumer electronics products like TV, washing machine and AC.
3. Identify and explain working of various color TV transmission blocks.
4. Adjust various controls of color TV receiver and troubleshoot it.
5. Use various functions of Cam coder and shoot a video and take snapshots and save them in appropriate format.

UNIT - 1

Communication devices

Mobile handsets, Android technology, 2G, 3G Mobiles, i-phone, EPABX

UNIT - 2

Mass Communication devices

Color Television, Antenna, HDTV, LCD TV, LED TV, 3D Technology In TV, Interactive TV, DTHTV, Plasma TV, Video Conferencing, FAX Machine, PA System, Dolby Digital Systems, Gesture Technology In TV.

UNIT - 3

Household electronics devices

Washing Machine, Microwave Oven, Types Applications, Electronics Weighing Balance, Air Conditioner, Vacuum Cleaner.

UNIT - 4

Printing and recording devices

LASER printer, Inkjet Printers, Photocopiers, Scanner, DVD/CD Player, Blue ray DVD Player.

UNIT - 5

Special purpose machines

Electronic Voting Machine, CFL, LED Lamps, Application and Advantages. Solar lamp, Water Purifier, Electronic Calculator, DVD Player, ATM

Security devices

Biometric attendance Monitoring System, Working, Biometric Sensors, Home Automation System.

UNIT - 6

Compliance:

Product safety and liability issues, standards related to electrical safety and standards related to fire hazards, e.g., UL and VDE. EM1/EMC requirements and design techniques for compliance, e.g. ESD, RF interference and immunity, line current harmonics and mains voltage surge.

TEXT/REFERENCE BOOKS

1. Television & Video Engineering-A. M. Dhake, TMH Publication.
2. Monochrome and Color TV - R. R. Gulati, Wiley Eastern publication.
3. Video demystified -Keith Jack, PI publication
4. Audio & Video Systems-R.G.Gupta
5. Audio and Video system - Principles, maintenance and Troubleshooting by R. Gupta
6. Arora C. P., "Refrigeration and Air conditioning", Tata McGraw-Hill, New Delhi, 1994
7. Color TV Theory & Practice -S. P. Bali. TMG Hill Publication.
8. Basic TV & Video Systems-Bernard Grobb.
9. Electronic Communication Systems, Kennedy, TMH.
10. Principles of Communication Engineering- Anokh Singh-TMH.
11. C. M. Wintzer, International Commercial EMC Standards, Interference Control Technologies 1988.

12. P. A. Chatterton and M. A. Houlden, EMC: Electromagnetic Theory to Practical Design. Wiley, 1992.
13. J. A. S. Angus, Electronic Product Design, Chapman and Hall, 1996.
14. Y. J. Wind, Product Policy: Concepts, Methods, and Strategy, Addison-Wesley Pub. Co. 1982.

BTETPE704B

Analog Integrated Circuit Design

3 Credits

Course Objectives:

- Introduction to Circuit Simulation & EM Simulations.
- Deep Understanding of MOS Device Physics & Modeling.
- Understanding of few transistor circuits like common gate, common source & common drain amplifiers with their frequency response.
- Understanding of Operational Amplifier Design & Trade-offs.
- Advanced Op-Amps and OTAs.
- Temperature Compensated Biasing Schemes.

Course Outcomes:

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

1. Describe the models for active devices in MOS and Bipolar IC technologies.
2. Describe layout considerations for active and passive devices in analog ICs.
3. Analyze and design IC current sources and voltage references.
4. Describe the noise sources and models applicable to ICs.
5. Understand and appreciate the importance of noise and distortion in analog circuits.
6. Analyze integrated circuit noise performance.
7. Analyze and design IC operational amplifiers.

UNIT - 1

Introduction to Simulations

Introduction to Advanced Design System and Cadence Virtuoso, DC Simulations, AC Simulations, Harmonic Balance, Envelope Simulation, Electromagnetic Simulations- FEM, MOM, FDTD, Circuit Net listing.

UNIT - 2

MOSFET Device Physics & Modeling

MOSFET Structure, Threshold Voltage, Drain Current Equation, Transfer & Output Characteristics, Weak/Moderate/Strong Inversion, Linear/Triode/Saturation Region of Operation, Device Leakages and Losses, Short Channel Effects, High Frequency Small Signal Model of MOSFET, Cubic, BSIM and Materka Models of MOSFET.

UNIT - 3

Few Transistor Circuits

Current Mirrors, Common Source/Common Gate/Common Drain Amplifiers, Design and Analysis of CS/CG/CD Amplifiers, Cascode Amplifiers, Differential Gain Stage, Frequency Response & Design Trade-offs, Telescopic Cascode and Wide Swing Cascode Current Mirrors, PTAT, CTAT & Bandgap Bias Circuits.

UNIT - 4

Operational Amplifiers & OTAs

Design of Classical Op-Amps, Op-Amp Characteristics, Analysis and Trade-offs, Wideband Op-Amps, High Speed Op-Amps, Very High Gain Op-Amps, Operational Transconductance Amplifiers, Ultra Low Power OTAs for Medical Implants, Folded Cascode Op-Amps.

UNIT - 5

Biasing Schemes

Voltage and Current References, V_t reference bias, PTAT Current Reference, CTAT and Bandgap Voltage References, High Precision Voltage References, Voltage Level Shifters.

UNIT - 6

Non-Linear Circuits

Single and Balanced Diode Mixers, Translinear Cell, Gilbert Cell Mixers, Power Amplifiers, Even & Odd Order Mixing, In-Modulation (AM, PM Conversions) Distortions, Intermodulation Distortions, Intermodulation Products, ACPR & EVM.

TEXT/REFERENCE BOOKS

1. Tony Chan Carusone, David A. Johns, Kenneth W. Martin, "Analog Integrated Circuit

2. Design”, John Wiley & Sons
3. Keliu Shu, Edgar Sanchez-Sinencio, “CMOS PLL Synthesizers”, Springer
4. Jose Carlos Pedro, Nuno Borges Carvalho, “Intermodulation Distortion in Microwave and Wireless Circuits”, Artech House
5. Stephen A. Maas, “Microwave Mixers”, Artech House.

BTETPE704C

Soft Computing

3 Credits

Course Objectives:

- Introduce a relatively new computing paradigm for creating intelligent machines useful for solving complex real world problems.
- Insight into the tools that make up the soft computing technique: fuzzy logic, artificial neural networks and hybrid systems Techniques.
- To create awareness of the application areas of soft computing technique.
- Provide alternative solutions to the conventional problem solving techniques in image/signal processing, pattern recognition/classification, control system.

Course Outcomes:

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

1. Use a new tool /tools to solve a wide variety of real world problems.
2. Find an alternate solution, which may offer more adaptability, resilience and optimization.
3. Identify the suitable antenna for a given communication system.
4. Gain knowledge of soft computing domain which opens up a whole new career option.
5. Tackle real world research problems.

UNIT - 1

Artificial Neural Network –I:

Biological neuron, Artificial neuron model, concept of bias and threshold, McCulloch- Pits Neuron Model, implementation of logical AND, OR, XOR functions Soft Topologies of neural networks, learning paradigms: supervised, unsupervised, reinforcement, Linear neuron model: concept of error energy, gradient descent algorithm and application of linear neuron for linear regression, Activation functions: binary, bipolar (linear, signup, log sigmoid, tan sigmoid) Learning mechanisms: Hebbian, Delta Rule o Perceptron and its limitations Draft.

UNIT - 2

Artificial Neural Network-II:

Multilayer perceptron (MLP) and back propagation algorithm o Application of MLP for classification and regression o Self-organizing Feature Maps, k- means clustering o Learning vector quantization Radial Basis Function networks: Cover's theorem, mapping functions(Gaussian, Multi-quadratics, Inverse multi quadratics, Application of RBFN for classification and regression o Hopfield network, associative memories.

UNIT - 3

Fuzzy Logic –I:

Concept of Fuzzy number, fuzzy set theory (continuous, discrete) o Operations on fuzzy sets, Fuzzy membership functions (core, boundary, and support), primary and composite linguistic terms, Concept of fuzzy relation, composition operation (T-norm,T-conorm) o Fuzzy if-then rules.

UNIT - 4

Fuzzy Logic –II:

Fuzzification, Membership Value Assignment techniques, De-fuzzification (Max membership principle, Centroid method, Weighted average method), Concept of fuzzy inference, Implication rules- Dienes-Rescher Implication, Mamdani Implication, Zadeh Implication, Fuzzy Inference systems -Mamdani fuzzy model, Sugeno fuzzy model , Tsukamoto fuzzy model, Implementation of a simple two-input single output FIS employing Mamdani model Computing.

UNIT - 5

Fuzzy Control Systems:

Control system design problem 1.5, Control (Decision) Surface, Assumptions in a Fuzzy Control System Design V, Fuzzy Logic Controllers Soft o Comparison with traditional PID control, advantages of FLC, Architecture of a FLC: Mamdani Type, Example Aircraft landing control problem.

UNIT - 6

Adaptive Neuro-Fuzzy Inference Systems (ANFIS):

ANFIS architecture, Hybrid Learning Algorithm, Advantages and Limitations of ANFIS
Application of ANFIS/CANFIS for regression.

TEXT/REFERENCE BOOKS

1. Fundamentals of Neural Networks: Architectures, Algorithms and Applications, Laurene Fausett, Pearson Education, Inc, 2008.
2. Fuzzy Logic with Engineering Applications, Third Edition Thomas, Timothy Ross, John Wiley & Sons, 2010.
3. Neuro- Fuzzy and Soft Computing, J.S. Jang, C.T. Sun, E. Mizutani, PHI Learning Private Limited.
4. Principles of Soft Computing, S. N. Sivanandam, S. N. Deepa, John Wiley & Sons, 2007.
5. Introduction to the theory of neural computation, John Hertz, Anders Krogh, Richard Palmer, Addison –Wesley Publishing Company, 1991.
6. Neural Networks A comprehensive foundation,, Simon Haykin, Prentice Hall International Inc-1999.
7. Neural and Adaptive Systems: Fundamentals through Simulations, José C. Principe Neil R. Euliano, W. Curt Lefebvre, John-Wiley & Sons, 2000.
8. Pattern Classification, Peter E. Hart, David G. Stork Richard O. Duda, Second Edition, 2000.
9. Pattern Recognition, Sergios Theodoridis, Konstantinos Koutroumbas, Fourth Edition, Academic Press, 2008.
10. A First Course in Fuzzy Logic, Third Edition, Hung T. Nguyen, Elbert A. Walker, Taylor & Francis Group, LLC, 2008.
11. Introduction to Fuzzy Logic using MATLAB, S. N. Sivanandam, S. Sumathi, S. N. Deepa, Springer Verlag, 2007.

BTETPE704D

Advance Industrial Automation-1

3 Credits

Course Objectives:

- To identify potential areas for automation and justify need for automation.
- To select suitable major control components required to automate a process or an activity.

- To translate and simulate a real time activity using modern tools and discuss the benefits of automation.

Course Outcomes:

After the successful completion of this course, the student will be able:

1. To identify suitable automation hardware for the given application.
2. To recommend appropriate modeling and simulation tool for the given manufacturing application.

UNIT - 1

Introduction:

Automation in Production System, Principles and Strategies of Automation, Basic Elements of an Automated System, Advanced Automation Functions, Levels of Automations. Flow lines & Transfer Mechanisms, Fundamentals of Transfer Lines. (SLE: Analysis of Transfer Lines).

UNIT - 2

Material handling and Identification Technologies:

Overview of Material Handling Systems, Principles and Design Consideration, Material Transport Systems, Storage Systems, Overview of Automatic Identification Methods (SLE: Material Identification Methods).

UNIT - 3

Automated Manufacturing Systems:

Components, Classification and Overview of Manufacturing Systems, Manufacturing Cells, GT and Cellular Manufacturing, FMS, FMS and its Planning and Implementation, Quality Control Systems: Traditional and Modern Quality Control Methods, SPC Tools, Inspection Principles and Practices, Inspection Technologies. (SLE: Usage of SPC tools using excel or Minitab).

UNIT - 4

Control Technologies in Automation:

Industrial Control Systems, Process Industries versus Discrete-Manufacturing Industries, Continuous Versus Discrete Control, Computer Process and its Forms, (SLE: Sensors, Actuators and other Control System Components).

UNIT - 5

Computer Based Industrial Control:

Introduction & Automatic Process Control, Building Blocks of Automation Systems: LAN, Analog & Digital I/O Modules, SCADA Systems & RTU. Distributed Control System: Functional Requirements, Configurations & some popular Distributed Control Systems (SLE: Display Systems in Process Control Environment).

UNIT - 6

Modeling and Simulation for Plant Automation:

Introduction, need for system Modeling, Building Mathematical Model of a Plant, Modern Tools & Future Perspective. Industrial Control Applications: Cement, Thermal, Water Treatment & Steel Plants. (SLE: Cases Studies minimum one for Cement, Thermal, Water Treatment & Steel Plants applications).

TEXT/REFERENCE BOOKS

1. Automation, Production Systems and Computer Integrated Manufacturing- M.P.Groover, Pearson Education.5th edition, 2009.
2. Computer Based Industrial Control- Krishna Kant, EEE-PHI,2nd edition,2010
3. An Introduction to Automated Process Planning Systems- Tiess Chiu Chang & Richard A. Wysk.
4. Performance Modeling of Automated Manufacturing Systems,-Viswanandham, PHI, 1st edition, 2009.

BTETPE704E

Mechatronics

3 Credits

Course Objectives:

- Understand key elements of Mechatronics system, representation into block diagram.
- Understand concept of transfer function, reduction and analysis.
- Understand principles of sensors, its characteristics, interfacing with DAQ microcontroller.

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- Understand the concept of PLC system and its ladder programming, and significance of PLC systems in industrial application.
- Understand the system modelling and analysis in time domain and frequency domain.
- Understand control actions such as Proportional, derivative and integral and study its significance in industrial applications.

Course Outcomes:

1. Identification of key elements of mechatronics system and its representation in terms of block diagram.
2. Understanding the concept of signal processing and use of interfacing systems such as ADC, DAC, digital I/O.
3. Interfacing of Sensors, Actuators using appropriate DAQ micro-controller.
4. Time and Frequency domain analysis of system model (for control application).
5. PID control implementation on real time systems.
6. Development of PLC ladder programming and implementation of real life system.

UNIT - 1

Introduction to Sensors & Actuators

Introduction to Mechatronics, Measurement characteristics: -Static and Dynamic Sensors: Position Sensors: -Potentiometer, LVDT, Encoders; Proximity sensors:-Optical, Inductive, Capacitive; Motion Sensors:-Variable Reluctance; Temperature Sensor: RTD, Thermocouples; Force / Pressure Sensors:-Strain gauges; Flow sensors: -Electromagnetic Actuators: Stepper motor, Servo motor, Solenoids.

UNIT - 2

Block Diagram Representation

Open and Closed loop control system, identification of key elements of mechatronics systems and represent into block diagram (Electro-Mechanical Systems), Concept of transfer function, Block diagram reduction principles, Applications of mechatronics systems:-Household, Automotive, Shop floor (industrial).

UNIT - 3

Data Acquisition & Microcontroller System

Interfacing of Sensors / Actuators to DAQ system, Bit width, Sampling theorem, Aliasing, Sample and hold circuit, Sampling frequency, ADC (Successive Approximation), DAC (R-2R), Current and Voltage Amplifier.

UNIT - 4

PLC

Programming Introduction, Architecture, Ladder Logic programming for different types of logic gates, Latching, Timers, Counter, Practical Examples of Ladder Programming, and Introduction to SCADA system.

UNIT - 5

Modelling and Analysis of Mechatronics System

System modelling (Mechanical, Thermal and Fluid), Stability Analysis via identification of poles and zeros, Time Domain Analysis of System and estimation of Transient characteristics: % Overshoot, damping factor, damping frequency, Rise time, Frequency Domain Analysis of System and Estimation of frequency domain parameters such as Natural Frequency, Damping Frequency and Damping Factor.

UNIT - 6

Control System

P, I and D control actions, P, PI, PD and PID control systems, Transient response:-Percentage overshoot, Rise time, Delay time, Steady state error, PID tuning (manual).

TEXT/REFERENCE BOOKS

1. K.P. Ramchandran, G.K. Vijayaraghavan, M.S. Balasundaram, Mechatronics: Integrated Mechanical Electronic Systems, Willey Publication, 2008
2. Bolton, Mechatronics -A Multidisciplinary approach, 4th Edition, Prentice Hall, 2009.
3. Alciatore & Histan, Introduction to Mechatronics and Measurement system, 4th Edition, McGraw Hill publication, 2011.
4. Bishop (Editor), Mechatronics –An Introduction, CRC Press, 2006.
5. Mahalik, Mechatronics –Principles, concepts and applications, Tata Mc - Graw Hill publication, New Delhi.

6. C. D. Johnson, Process Control Instrumentation Technology, Prentice Hall, New Delhi.

BTETPE704F

Electronics in Smart City

3 Credits

Course Objectives:

Course Outcomes:

UNIT - 1

Necessity of SMART CITY

The Smart City Philosophy, Development of Asian Cities, Megacities of India: Current Challenges, The India Story of Smart Cities, Conceptual Basis of a Smart City, Global Smart City Programs, Recommendations for Smart City Framework in GCC.

UNIT - 2

SMART CITY and IOT

Introduction to Internet of Things, applications in smart city & their distinctive advantages - smart environment, smart street light and smart water & waste management. What is an IOT? Role and scope of IOT in present and future marketplace.

UNIT - 3

SMART Objects

Smart objects, Wired – Cables, hubs, etc., Wireless – RFID, WiFi, Bluetooth, etc. Different functional building blocks of IOT architecture

UNIT - 4

Smart Cities: Distributed Intelligence and Central Planning

On the Interplay between Humans and Smart Devices, Theoretical Tools, Intelligence-Artificial Intelligence (Machine Intelligence), Information Dynamics, Synergetic, Information Dynamics and Allometry in Smart Cities.

UNIT - 5

Wireless Protocols for Smart Cities

IPv6 over Low-Power Wireless Personal Area Network: Features, Addressing, Packet fragmentation, Operation, Security. ZigBee: Architecture Objectives, Wireless Networking

Basics, Wireless Networking Assumptions, Bluetooth Low Energy, Constrained Application Protocol, Message Queue Telemetry Protocol.

UNIT - 6

Leveraging Smart City Projects for Benefitting Citizens: The Role of ICTs

Smart City and ICT: Using Technologies to Improve the Citizens' Quality of Life, Smart City Goals: The Impact on Citizens' Well-Being and Quality of Life, Critical Dimensions: Urbanization, Local Climate Change, and Energy Poverty, Environmental Issues: The Role of Local and Global Climate Chang.

TEXT/REFERENCE BOOKS

BTETPE801A

Entrepreneurship Development

3 Credits

Course Objectives:

- To Develop and Strengthen Entrepreneurial Quality and Motivation in Students and To Impart Basic Entrepreneurial Skills and Understanding to Run a Business Efficiently and Effectively.
- The students develop and can systematically apply an entrepreneurial way of thinking that will allow them to identify and create business opportunities that may be commercialized successfully.

Course Outcomes:

After the completion of the course, the students will be able to:

1. Have the ability to discern distinct entrepreneurial traits.
2. Know the parameters to assess opportunities and constraints for new business ideas.
3. Understand the systematic process to select and screen a business idea.
4. Design strategies for successful implementation of ideas.

5. Write a business plan.

UNIT - 1

Entrepreneurship

Entrepreneur – Types of Entrepreneurs – Difference Between Entrepreneur And Intrapreneur
Entrepreneurship In Economic Growth, Factors Affecting Entrepreneurial Growth.

UNIT - 2

Motivation

Major Motives Influencing An Entrepreneur – Achievement Motivation Training, Self
Rating, Business Games, Thematic Apperception Test – Stress Management,
Entrepreneurship Development Programs – Need, Objectives.

UNIT - 3

Business

Small Enterprises – Definition, Classification – Characteristics, Ownership Structures –
Project Formulation – Steps Involved In Setting Up A Business – Identifying, Selecting A
Good Business Opportunity, Market Survey And Research,

UNIT - 4

Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports –
Project Appraisal – Sources of Information – Classification of Needs And Agencies.

UNIT - 5

Financing and Accounting

Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution,
Management of Working Capital, Costing, Break Even Analysis, Taxation – Income Tax,
Excise Duty – Sales Tax.

UNIT - 6

Support to Entrepreneurs

Sickness In Small Business – Concept, Magnitude, Causes And Consequences, Corrective
Measures – Business Incubators – Government Policy For Small Scale Enterprises – Growth
Strategies In Small Industry – Expansion, Diversification, Joint Venture, Merger And Sub
Contracting.

TEXT/REFERENCE BOOKS

1. Khanka. S.S., “Entrepreneurial Development” S. Chand & Co. Ltd., Ram Nagar, New Delhi, 2013.
2. Donald F Kuratko, “Entrepreneuership – Theory, Process and Practice”, 9th Edition, Cengage Learning 2014.
3. Hisrich R D, Peters M P, “Entrepreneurship” 8th Edition, Tata McGraw-Hill, 2013.
4. Mathew J Manimala, “Enterpreneuership Theory At Cross Roads: Paradigms and Praxis” 2nd Edition Dream Tech, 2005.
5. Rajeev Roy, ‘Entrepreneurship’ 2nd Edition, Oxford University Press, 2011.
6. EDII “Faulty and External Experts – A Hand Book For New Entrepreneurs Publishers: Entrepreneurship Development”, Institute of India, Ahmadabad, 1986.

BTETPE801B

Mixed Signal Design

3 Credits

Course Objectives:

- To introduce how to handle the practical situations where mixed signal analysis is required.
- To analyze and handle the inter-conversions between signals.
- To introduce the students how to design systems involving mixed signals.

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Understand the practical situations where mixed signal analysis is required.
2. Analyze and handle the inter-conversions between signals.
3. Design systems involving mixed signals.

UNIT - 1

Analog and discrete-time signal processing, introduction to sampling theory; Analog continuous-time filters: passive and active filters.

UNIT - 2

Basics of analog discrete-time filters and Z-transform.

UNIT - 3

Switched-capacitor filters- Non idealities in switched-capacitor filters, Switched-capacitor filter architectures, Switched-capacitor filter applications.

UNIT - 4

Basics of data converters; Successive approximation ADCs, Dual slope ADCs, Flash ADCs, Pipeline ADCs, Hybrid ADC structures, High-resolution ADCs, DACs.

UNIT - 5

Mixed-signal layout, Interconnects and data transmission, Voltage-mode signaling and data transmission, Current-mode signaling and data transmission.

UNIT - 6

Introduction to frequency synthesizers and synchronization, Basics of PLL, Analog PLLs, Digital PLLs, DLLs.

TEXT/REFERENCE BOOKS

1. R. Jacob Baker, CMOS mixed-signal circuit design, Wiley India, IEEE press, reprint 2008.
2. Behzad Razavi, Design of analog CMOS integrated circuits, McGraw-Hill, 2003.
3. R. Jacob Baker, CMOS circuit design, layout and simulation, revised second edition, IEEE press, and 2008.
4. Rudy V. de Plassche, CMOS Integrated ADCs and DACs, Springer, Indian edition, 2005.
5. Arthur B. Williams, Electronic Filter Design Handbook, McGraw-Hill, 1981.
6. R. Schauman, Design of analog filters by, Prentice-Hall 1990 (or newer additions).
7. M. Burns et al., An introduction to mixed-signal IC test and measurement by, Oxford University Press, First Indian edition, 2008.

BTETPE801C

Bio-medical Signal Processing

3 Credits

Course Objectives:

- To understand the basic signals in the field of biomedical.
- To study origins and characteristics of some of the most commonly used biomedical signals, including ECG, EEG, evoked potentials, and EMG.

- To understand Sources and characteristics of noise and artifacts in bio signals.
- To understand use of bio signals in diagnosis, patient monitoring and physiological investigation.
- To explore research domain in biomedical signal processing.
- To explore application of established engineering methods to complex biomedical signal problems.

Course Outcomes:

After successfully completing the course students will be able to:

1. The student will be able to model a biomedical system
2. The student will be able to understand various methods of acquiring bio signals.
3. The student will be able to understand various sources of bio signal distortions and its Remedial techniques
4. The students will be able to analyze ECG and EEG signal with characteristic feature points.
5. The student will have a basic understanding of diagnosing bio-signals and classifying them.

UNIT - 1

Introduction to Biomedical Signals

ECG, EEG, EMG, ENG etc. Event related potentials Biomedical Signal Analysis- Computer Aided Diagnosis. Concurrent, coupled and correlated processes - illustration with case studies. Noise Filtering: Random noise structured noise and physiological interference- noise and artifacts in ECG.

UNIT - 2

Time domain filters and Frequency domain Filters

Principles of adaptive filters- Winer Filtering- Steepest Descent algorithms- Widrow Hopf Least mean square adaptive algorithms- Adaptive noise canceller- Interference cancellation in Electrocardiography- noise cancellation in electro surgery.

UNIT - 3

Event Detection

Detection of P, QRS and T waves in ECG- EEG rhythms- Correlation and coherence analysis of EEG channels- Detection of EEG spike and wave complexes-

Homomorphic filtering. Analysis of event related potential – Morphological analysis of ECG waves- Envelope extraction and analysis- Analysis of activity: zero crossing rates.

UNIT - 4

Fourier Spectrum, Estimation of power spectral density

Moments and spectral power ratio. Power Cepstrum- Complex Cepstrum Biomedical applications of Cepstrum analysis.

UNIT - 5

Modeling of Biomedical systems:

Point processes- Parametric system modeling- All-pole, pole zero modeling, electromechanical models of signal generation. Analysis of non-stationary signals: Characterization- Fixed segmentation- Short Time Fourier Transform-Adaptive segmentation Adaptive filters for segmentation- RLS and Lattice Filter.

UNIT - 6

Pattern classification and diagnostic decision:

Supervised and unsupervised pattern classification Probabilistic models and statistical decisions- Logistic regression analysis- training and test stepsneural networks- Measures of diagnostic accuracy and cost- Reliability of classifiers and decisions. Application: Normal versus Ectopic ECG beats- Detection of Knee Joint cartilage pathology.

TEXT/REFERENCE BOOKS

1. Rangaraj M. Rangayyan, “Biomedical Signal Analysis: A case study Approach”, Wiley Interscience 2002.24.
2. D. C .Reddy, “Biomedical Signal Processing: Principles and techniques”, Tata McGrawHill, NewDelhi, 2005.
3. Metin Akay, “Biomedical Signal Processing”, Academic press, Inc.
4. Bruce, “Biomedical Signal Processing & Signal Modeling,” Wiley, 2001.
5. Sornmo, “Bioelectrical Signal Processing in Cardiac & Neurological Applications”, Elsevier.
6. Semmlow, Marcel Dekker “Biosignal and Biomedical Image Processing”, 2004.
7. Enderle, “Introduction to Biomedical Engineering,” 2/e, Elsevier, 2005.

BTETPE801D

Multirate Digital Signal Processing

3 Credits

Course Objectives:

- This Multirate Signal Processing course covers advanced techniques for the design of digital filters, which are essential components in almost every digital signal processing system, as well as cyclostationary signals, so important to the understanding of modulation systems.
- The course then moves on to treat multi-rate systems and presents multi-rate processing of both deterministic and random signals, culminating in a full case study exercise.
- To analyze multi-rate systems and the effects of interpolation and decimation on deterministic signals.
- To analyze the effects of interpolation and decimation on random signals.
- To design interpolation and decimation filters to a given specification.

Course Outcomes:

After successfully completing the course students will have:

1. Ability to understand the concepts of sampling rate conversions, Decimation and Interpolation as part of Signal Processing techniques.
2. Able to explain how the multirate implementation of ADC and DAC converters works.
3. Able to describe basic sampling rate conversion algorithms.
4. Able to draw and describe different kinds of interpolator and decimator.
5. Able to analyze how the interpolated FIR filter works.
6. Able to do sampling rate conversion.

UNIT - 1

Fundamentals of Multirate Systems

Introduction, Basic multirate operations, Interconnection of building blocks, Polyphase representation, Multistage implementation, Some application of multirate systems, Special filter and filter banks.

UNIT - 2

Maximally Decimated Filter Banks

Introduction, Errors created in the QMF bank, A simple alias free QMFsystem, Power symmetric QMF banks, M-channel filter banks, Polyphase representation, Perfect reconstruction system, alias free filter banks, Treestructured filter banks, Transmultiplexer.

UNIT - 3

Paranitary Perfect Reconstruction Filter Banks

Introduction, Lossless transfer matrices, Filter banks properties induced by paraunitariness, Two channel FIR paraunitary QMF banks, Two channel paraunitary QMF lattice, M - channel FIR paraunitary filter banks, Tranformcoding and LOT.

UNIT - 4

Linear Phase and Cosine Modulated Filter Banks

Introduction, Some necessary conditions, Lattice structure for linear phase FIR PR banks, formal synthesis of linear phase FIR PR QMF Lattice. Pseudo QMF banks, Design of the pseudo QMF bank, Efficient polyphase structure, Cosine modulated perfect reconstruction system.

UNIT - 5

The Wavelet Transform and its Relation to Multirate Filter Banks

Introduction, Background and outline, Short time fourier transform, The Wavelet transform, DT orthonormal Wavelets, Continuous time orthonormal Wavelet basis.

UNIT - 6

Multidimensional, Multivariable and Lossless Systems

Introduction, Multidimensional signals, Sampling a multidimensional Signals, Multirate fundamentals.Review of discrete time multi-input multi-output LTI System, ParaUNITary and lossless system.

TEXT/REFERENCE BOOKS

1. P. P. Vaidyanathan , PTR Prentice Hall, Englewood Cliffs , New Jersey, Multirate System and Filter Banks.
2. N. J. Fliege , John Wiley & Sons, Multirate Digital Signal Processing.
3. Raghuvver Rao, Ajit Bopardikar, Pearson Education Asia, Wavelet Transforms Introduction to Theory and Application.
4. C. Sidney Burrus , R.A.Gopianath , Prentice Hall, Introduction to wavelet and wavelet Transform.

BTETPE801E

Wavelet Theory

3 Credits

Course Objectives:

- To understand time-frequency nature of the signals.
- To introduce the students how wavelets can be applied on the signals.

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Understand time-frequency nature of the signals.
2. Apply the concept of wavelets to practical problems.
3. Mathematically analyze the systems or process the signals using appropriate wavelet functions.

UNIT - 1

Introduction

Introduction to time frequency analysis; the how, what and why about wavelets, Short-time Fourier transform.

UNIT - 2

Continuous and Discrete Wavelet Transform

Wigner-Ville transform, Continuous time wavelet transform, discrete wavelet transform.

UNIT - 3

Construction of Wavelets

Tiling of the time-frequency plane and wave packet analysis, Construction of wavelets.

UNIT - 4

Multi Resolution Analysis

Multi resolution analysis, Introduction to frames and biorthogonal wavelets.

UNIT - 5

Filter Bank Theory

Multirate signal processing and filter bank theory.

UNIT - 6

Applications

Application of wavelet theory to signal denoising, image and video compression, multi-tone digital communication, transient detection.

TEXT/REFERENCE BOOKS

1. Y. T. Chan, Wavelet Basics, Kluwer Publishers, Boston, 1993.
2. I. Daubechies, Ten Lectures on Wavelets, Society for Industrial and Applied Mathematics, Philadelphia, PA, 1992.
3. C. K. Chui, An Introduction to Wavelets, Academic Press Inc., New York, 1992.
4. Gerald Kaiser, A Friendly Guide to Wavelets, Birkhauser, New York, 1995.
5. P. P. Vaidyanathan, Multirate Systems and Filter Banks, Prentice Hall, New Jersey, 1993.
6. A.N. Akansu and R.A. Haddad, Multiresolution signal Decomposition: Transforms, Subbands and Wavelets, Academic Press, Oranld, Florida, 1992.
7. B.Boashash, Time-Frequency signal analysis, In S.Haykin, (editor), Advanced Spectral Analysis, pages 418--517. Prentice Hall, New Jersey, 1991.

BTETPE802A

e-Yantra

3 Credits

BTETPE802B

Mobile Communication & Networks

3 Credits

Course Objectives:

- To provide an overview of Mobile Communication Networks area and its applications in communication engineering.
- To appreciate the contribution of mobile communication networks to overall technological growth.
- To explain the various terminology, principles, devices, schemes, concepts, algorithms and different methodologies used in Mobile Communication Networks.

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Understand the working principles of the mobile communication systems.
2. Understand the relation between the user features and underlying technology.
3. Analyze mobile communication systems for improved performance.

UNIT - 1

Cellular concepts

Cell structure, frequency reuse, cell splitting, channel assignment, handoff, interference, capacity, power control; Wireless Standards: Overview of 2G and 3G cellular standards.

UNIT - 2

Signal propagation

Propagation mechanism- reflection, refraction, diffraction and scattering, large scale signal propagation and lognormal shadowing. Fading channels-Multipath and small scale fading-Doppler shift, statistical multipath channel models, narrowband and wideband fading models, power delay profile, average and rms delay spread, coherence bandwidth and coherence time,

flat and frequency selective fading, slow and fast fading, average fade duration and level crossing rate, Capacity of flat and frequency selective channels.

UNIT - 3

Antennas

Antennas for mobile terminal- monopole antennas, PIFA, base station antennas and arrays

UNIT - 4

Multiple access schemes

FDMA, TDMA, CDMA and SDMA, Modulation schemes- BPSK, QPSK and variants, QAM, MSK and GMSK, multicarrier modulation, OFDM

UNIT - 5

Receiver structure

Diversity receivers- selection and MRC receivers, RAKE receiver, equalization: linear-ZFE and adaptive, DFE. Transmit diversity-Altamonte scheme, MIMO and space time signal processing, spatial multiplexing, diversity/multiplexing tradeoff

UNIT - 6

Performance measures

Outage, average SNR, average symbol/bit error rate, System examples- GSM, EDGE, GPRS, IS-95, CDMA 2000 and WCDMA.

TEXT/REFERENCE BOOKS

1. WCY Lee, Mobile Cellular Telecommunications Systems, McGraw Hill, 1990.
2. WCY Lee, Mobile Communications Design Fundamentals, Prentice Hall, 1993.
3. Raymond Steele, Mobile Radio Communications, IEEE Press, New York, 1992.
4. AJ Viterbi, CDMA: Principles of Spread Spectrum Communications, Addison Wesley, 1995.
5. VK Garg & JE Wilkes, Wireless & Personal Communication Systems, Prentice Hall, 1996.

BTETPE802C

Geo-Informatics and Spatial Computing

3 Credits

Course Objectives:

- Maximizing the efficiency of planning and decision making
- Integrating information from multiple sources

Course Outcomes:

At the end of the course, students will be able to map, analyze, manipulate and store geographical data in order to provide solutions to real world problems and help in planning for the future.

UNIT - 1

Introduction to Geo-informatics

Introduction to GIS, History of GIS, Early developments in GIS, Applications of GIS.

UNIT - 2

Maps and Projection

Introduction to Maps, History of Maps, Map Scales, Types of Maps, Map and Globe, Understanding Earth, Coordinate System, Map Projection, Transformation, Geo-referencing.

UNIT - 3

Spatial DBMS and Data Models

Introduction, Data Storage, Database Structure Models, Database Management system, Entity Relationship Model, Normalization, GIS Data Model, Vector Data Structure, Raster Data structure, Geo-database and metadata.

UNIT - 4

Spatial Data Analysis

Primary Data, Secondary Data, Data Editing, Introduction to spatial analysis, Vector Operations and Analysis, Network Analysis, Raster Data Spatial Analysis

UNIT - 5

Cartographic Principles and Design

Introduction, Map layout, Data presentation, Toposheet Indexing, Distribution Maps.

UNIT - 6

Interpolation and Web GIS

Introduction to Interpolation, Global Methods of Interpolation, Local Methods of Interpolation, Introduction to Web GIS, OGC Standards and services.

TEXT/REFERENCE BOOKS

1. Burrough, P. A., and McDonnell, R. A., Principles of Geographical Information Systems, 2nd Edition, Oxford University Press, 1998
2. Demers, M. N., Fundamentals of Geographic Information Systems, John Wiley & Sons, 3rd Edition, 2002
3. Longley, P. A., Goodchild, M. F., Maguire, D. J., and Rhind, D. W., Geographic Information Systems and Science, 2nd Edition, John Wiley and Sons, 2005
4. Longley, P. A., Goodchild, M. F., Maguire, D. J., and Rhind, D. W., Geographical Information Systems: Principles, Techniques, Management and Applications, 2nd Edition, John Wiley & Sons, 2005.
5. Kang-tsung Chang, "Introduction to Geographic Information Systems", McGraw-Hill Book Company, 2006.
6. Ramez Elmasri, Shamkant B.Navathe, "Fundamental of Database Systems", Pearson Addison Wesley, 2003.
7. Shashi Shekhar and Sanjay Chawla, "Spatial Databases: A Tour", Prentice Hall, 2003.

BTETPE802D

Software Defined Radio

3 Credits

Course Objectives:

- The objective of this course is to provide knowledge of fundamental and state-of the art concepts in software defined radio.
- To understand the various components of software-defined-radios with the understanding of their limitation and application of 'software-defined-solutions' to overcome such limitations.
- To Understanding the interplay of analog and digital signal processing for power as well as spectrum efficient transmission and reception of signal leads to an optimized, yet, practical radio solution.

Course Outcomes:

1. The student will study Needs, Characteristics, Benefits and Design Principles of a Software Radio.
2. The student will be study design aspects of software radios.
3. The student will understand concept of Smart Antennas.
4. The student will study key hardware elements and related Trade-Offs.

UNIT - 1

Fundamentals of SDR:

Software Radios, Needs, Characteristics, Benefits, Design Principles of a Software Radio, Radio frequency implementation issues, Principal Challenge of Receiver Design

UNIT - 2

RF and SDR:

RF Receiver Front-End Topologies, Enhanced Flexibility of the RF Chain with Software Radios, Transmitter Architectures and their issues, Noise and Distortion in the RF Chain, Timing Recovery in Digital Receivers Using Multirate Digital Filters

UNIT - 3

Signals in SDR:

Approaches to Direct Digital Synthesis, Analysis of Spurious Signals, Spurious Components due to Periodic Jitter, Band-pass Signal Generation, Hybrid DDS-PLL Systems, Generation of Random Sequences, Parameters of data converters

UNIT - 4

Smart Antennas:

Concept of Smart Antennas, Structures for Beam-forming Systems, Smart Antenna Algorithms, Digital hardware choices, Key Hardware Elements, DSP Processors, Field Programmable Gate Arrays, Trade-Offs in Using DSPs, FPGAs and ASICs.

UNIT - 5

Case studies in Radio System:

Power Management Issues, Object-oriented representation of radios and network resources, Mobile Application Environments, Joint Tactical Radio System, Case studies in software radio design.

TEXT/REFERENCE BOOKS

1. Jeffrey H. Reed, "Software Radio: A Modern Approach to Radio Engineering", Prentice Hall PTR; May 2002 ISBN: 0130811580
2. Dillinger, Madani, Alonistioti (Eds.), "Software Defined Radio, Architectures, Systems and Functions", Wiley 2003
3. Bard, Kovarik, "Software Defined Radio, The Software Communications Architecture", Wiley 2007
4. Johnson, C.R. and W.A. Sethares, "Telecommunication Breakdown: Concepts of Communication Transmitted via Software-Defined Radio, Pearson Prentice Hall, 2004
5. Bard, John and Kovarik, Vincent, "Software Defined Radio: The Software Communications Architecture", Wiley Series in Software Radio, 2007.

BTETPE802E

Under Water Signal Processing

3 Credits

BTETOE803A

Advanced Industrial Automation 2

3 credits

Course Objectives:

The trend in the Industry for automation is changing one and student will able to develop the skill set for latest development of automation.

Course Outcomes:

1. Select & identify suitable automation hardware for the given application.
2. Describe & explain potential areas of automation.
3. Differentiate various control aspects of automation.
4. Demonstrate the self-learning capability of Industrial Automation.

UNIT - 1

Control panel designing:

Different types of panels, basic components to be installed in a panel, wiring details of panel, specification and physical dimension of components, earthing and cabling of panels-standard procedures, P&I diagram preparation.

UNIT - 2

Supervisory control and data acquisition (SCADA):

SCADA Packages, role of SCADA in industrial automation, SCADA system configuration, RTU communication protocols, script writing, real And historical trend, configuring alarm, real time project development with PLC interfacing, communication with other software, recipe management, accessing different security levels. Report generation of current plant.

UNIT - 3

Pneumatics:

Physical fundamentals of Pneumatics, Function and application of pneumatic components, Designation and drawing of pneumatic symbols, Drawing pneumatic circuit diagrams in accordance with standards. Direct and indirect stroke-dependent control systems Shutoff valves, Logical Elements, Time-dependent control systems with time delay valve, Pressure-dependent control systems with pressure sequence valves. Electro pneumatic :Function & use of electrical & electro pneumatic components such as switches, pushbuttons & solenoid valves, pneumatic symbols, Development of circuit

diagrams, Direct & indirect activation of cylinder, Logics, Position control circuits, Exercises.

UNIT - 4

Hydraulics:

Introduction, Basic principles, Hydraulic system structure, Hydraulic Pumps, Pressure control valves, Direction control valves, Check valves, Flow control valves, Actuators, Exercises. Electro hydraulics: Function & use of electrical & electro hydraulic components such as switches, pushbuttons & solenoid valves. Naming & identifying electrical & hydraulic symbols. Development & reading of circuit diagrams. Direct & indirect activation of cylinders. Activation of hydraulic motor, Position control circuits, Interlock circuits, rapid traverse circuits.

UNIT - 5

Industrial Control Application:

Cement Plants: Objective of automation system, Automation strategy, Distributed control system for cement plants, Thermal power plant: Automation strategy, Distributed system structure for cement plants, Man-machine interface, software system. Water Treatment Plant: Automation strategy, Distributed digital control, Irrigation Canal automation: Automation strategy, Decision support system at central computer.

UNIT - 6

Project Management

Design concept, kickoff meeting, Design: BOM, control panel, power flow diagram
Dough Maker, yogurt mixer, carton sorting, safety in automation.

TEXT/REFERENCE BOOKS

1. Computer based Process Control by Krishna Kant, PHI Publications.
2. Pneumatic controls by Joji P. (Author), Wiley India Publications.
3. Oil hydraulic systems by S. R. Mujumdar, Tata McGraw Hill publications.
4. Pneumatic systems by S. R. Mujumdar, Tata McGraw hill publications.

Course Objectives:

- To introduce how to handle the practical situations where mixed signal analysis is required.
- To analyze and handle the inter-conversions between signals.
- To introduce the students how to design systems involving mixed signals.

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Understand the practical situations where mixed signal analysis is required.
2. Analyze and handle the inter-conversions between signals.
3. Design systems involving mixed signals.

UNIT - 1

Embedded Software, Firmware Concepts and Design

Embedded C-programming concepts (from embedded system point of view): Optimizing for Speed/Memory needs, Interrupt service routines, macros, functions, modifiers, data types, device drivers, Multithreading programming. (Laboratory work on J2ME Java mobile application). Basic embedded C programs/applications for ARM-v7, using ARM-GCC-tool-chain, Emulation of ARM-v7 (e.g. using QEMU), and Linux porting on ARM-v7 (emulation) board, Real time operating system: POSIX Compliance, Need of RTOS in Embedded system software, Foreground/Background systems, multitasking, context switching, IPC, Scheduler policies, Architecture of kernel, task scheduler, ISR, Semaphores, mailbox, message queues, pipes, events, timers, memory management, RTOS services in contrast with traditional OS.

Introduction to μ COS-II RTOS, study of kernel structure of μ COS-II, Synchronization in μ COS-II, Inter-task communication in μ COS-II, Memory management in μ COS-II, porting of RTOS on ARM-v7 (emulation) board, Application developments using μ COSII.

Introduction to Linux OS, Linux IPC usage, basic device (drivers) usage

UNIT - 2

Simulation, Testing and Debugging Methodology and Tools

GNU Debugger (gdb), Boundary-Scan/JTAG interface concepts, Black-box, White-box testing, Hardware emulation, logic analyzer

UNIT - 3

Embedded System Designing

Requirement analysis, Hardware blocks diagram, System model (like FSM, UML), Software architectures (modules, drivers), and Component/hardware selection, covering following cases: Hard real time/ Mission critical: Missile, Car cruise control, medical monitoring systems, process control system (temp, pressure) Soft real time: Automated vending machines, digital camera, media-player. Communication: Embedded web servers, routers, Wireless (sensor) networks.

UNIT - 4

Introduction to IoT

Introduction to IoT, Sensing, Actuation, Basics of Networking, Basics of Networking, Communication Protocols, Sensor Networks, Machine-to-Machine Communications, Interoperability in IoT, Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino.

UNIT - 5

Introduction to programming

Introduction to Python programming, Introduction to Raspberry Pi, Implementation of IoT with Raspberry Pi, Introduction to SDN, SDN for IoT.

UNIT - 6

Applications

Case Study: Smart Cities and Smart Homes, Smart Grid, Agriculture, Healthcare, Activity Monitoring.

TEXT/REFERENCE BOOKS

1. Embedded Systems, Rajkamal , TMH, 2008.
2. Frank Vahid - Embedded Systems , Wiley India, 2002
3. ARM System-on-Chip Architecture, Steve Furber - Pearson 2005
4. Jean J Labrose - MicroC / OS-II, Indian Low Price Edition 2002
5. DR.K.V.K.K. Prasad - Embedded / real time system, Dreamtech
6. Iyer, Gupta - Embedded real systems Programming , TMH

7. Embedded systems software primer, David Simon - Pearson
8. ARM System Developers Guide- Sloss, Symes, Wright, ElsevierMorgan Kaufman, 2005
9. LPC2148 Data Sheets www.arm.com
10. ARM Programers/architectural manual.
11. MSP430 architectural manual.
12. Embedded Microcomputer Systems – Real Time Interfacing – Jonathan W. Valvano; Cengage Learning; Third or later edition.
13. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
14. "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madiseti (Universities Press).

BTETOE803C

Industrial Drives and control

3 Credits

Course Objectives:

- To expose the students to the Engineering fundamentals of various Drives and its control, Dynamic operation and their Applications.

Course Outcomes:

At the end of the course, students will demonstrate the ability to gain an ability to design and conduct performance experiments, as well as to identify, formulate and solve drives related problems.

UNIT - 1

Electrical Drives:

Introduction & Dynamics Introduction, Advantages of Electrical Drives, Parts of Electrical Drives, Choice of Electrical Drives, Status of DC and AC Drives, Fundamental Torque equations, Speed Torque conventions and Multi-quadrant Operation, Equivalent values of Drive Parameter, Measurement of Moment of Inertia, Components of Load Torques, Nature and Classification of Load Torques, Calculation of Time and Energy-Loss in Transient Operations, Steady State Stability, Load Equalization.

UNIT - 2

Selection of Motor Power Rating:

Thermal Model of Motor for Heating and Cooling, Classes of Motor Rating, Determination of Motor Rating.

UNIT - 3

Control of Electrical Drives:

Modes of Operation, Speed Control, Drive Classification, and Closed loop Control of Drives

UNIT - 4

DC Drives:

Review of Speed Torque relations for Shunt, Series and Separately excited Motors, Review of Starting, Braking (Regenerative, Dynamic, Plugging), Review of Speed control, Controlled rectifier fed DC drives (separately excited only): Single phase fully-controlled Rectifier, Single phase Half controlled Rectifier, Three phase fully-controlled Rectifier, Three phase Half-controlled Rectifier, Dual Converter Control, Chopper Control – Motoring and Braking of separately excited and Series Motor. (No numerical from this module).

UNIT - 5

AC Drives:

Induction Motor drives, Review of Speed-Torque relations, Review of Starting methods, Braking (Regenerative, Plugging and AC dynamic braking), Transient Analysis, Speed Control: Stator voltage control, Variable frequency control from voltage source, Static Rotor Resistance control, Slip Power Recovery - Static Scherbius Drive, Review of d-q model of Induction Motor, Principle of Vector Control, Block diagram of Direct Vector Control Scheme, Comparison of Scalar control and Vector control, Basic Principle of Direct Torque Control (block diagram) of induction motor. Introduction to Synchronous Motor Variable Speed drives.

UNIT - 6

Special Motor Drives:

Stepper Motor drives- Types, Torque vs. Stepping rate characteristics, Drive circuits, Introduction to Switched reluctance motor drives and Brushless DC motor drives.

TEXT/REFERENCE BOOKS

1. Fundamentals of Electrical Drives by G. K. Dubey, Narosa Publication
2. A First Course on Electrical Drives by S. K. Pillai, New Age International.
3. Electrical Drives: Concepts and Applications by Vedam Subramanyam, T.M.H
4. Modern Power Electronics and AC Drives by B. K. Bose, Prentice Hall PTR
5. Special Electrical Machines by E.G. Janardanan, PHI
6. Electric Motor Drives: Modeling, Analysis and Control by Krishnan. R, PHI
7. Power Electronics by Joseph Vithayathil, Tata McGraw Hill
8. Power Semiconductor Controlled Drives by G. K. Dubey, Prentice Hall International.

BTETOE803D

Robotics Design

3 credits

Course Objectives:

- To prepare students with basics of robotics
- To familiarize students with kinematics & dynamics of robots
- To familiarize students with path & Trajectory planning of robots
- To familiarize students with robot vision

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Describe kinematics and dynamics of stationary and mobile robots
2. Describe trajectory planning for robots.
3. Implement trajectory generation and path planning various algorithms
4. Work in interdisciplinary projects.

UNIT - 1

Fundamentals of Robotics

Robot Classification, Robot Components, Degrees of freedom, Joints, Coordinates, Coordinate frames, workspace, applications.

UNIT - 2

Forward & Inverse Kinematics of Robots

Homogeneous transformation matrices, Inverse transformation matrices, Forward and inverse kinematic equations – position and orientation, Denavit-Hatenberg representation of forward kinematics, Inverse kinematic solutions, Case studies

UNIT - 3

Velocity Kinematics & Dynamics

Differential motions and velocities: Differential relationship, Jacobian, Differential motion of a frame and robot, Inverse Jacobian, Singularities. Dynamic Analysis of Forces: Lagrangian mechanics, Newton Euler formulation, Dynamic equations of robots, Transformation of forces and moment between coordinate frames

UNIT - 4

Robot Motion Planning

Concept of motion planning, Bug Algorithms – Bug1, Bug2, Tangent Bug

UNIT - 5

Potential Functions and Visibility Graphs

Attractive/Repulsive potential, Gradient descent, wave-front planner, navigation potential functions, Visibility map, Generalized Voronoi diagrams and graphs, Silhouette methods

UNIT - 6

Trajectory planning

Trajectory planning, Joint-space trajectory planning, Cartesian-space trajectories.

Robot Vision Image representation, Template matching, Polyhedral objects, Shape analysis, Segmentation, Iterative processing, Perspective transform.

TEXT/REFERENCE BOOKS

1. Robert Shilling, Fundamentals of Robotics - Analysis and control, Prentice Hall of India
2. Saeed Benjamin Niku, "Introduction to Robotics – Analysis, Control, Applications", Wiley India Pvt. Ltd., Second Edition, 2011
3. Howie Choset, Kevin M. Lynch, Seth Hutchinson, George Kantor, Wolfram Burgard, Lydia E. Kavraki and Sebastian Thrun, "Principles of Robot Motion – Theory, Algorithms and Implementations", Prentice-Hall of India, 2005.
4. Mark W. Spong , Seth Hutchinson, M. Vidyasagar, "Robot Modeling & Control ", Wiley India Pvt. Ltd., 2006
5. John J. Craig, "Introduction to Robotics – Mechanics & Control", Third Edition, Pearson Education, India, 2009
6. Aaron Martinez & Enrique Fernandez, "Learning ROS for Robotics Programming", Shroff Publishers, First Edition, 2013.
7. Mikell P. Groover et.al, "Industrial Robots-Technology, Programming & applications", McGraw Hill , New York, 2008

BTETOE803E

Block Chain Technology

3 Credits

Course Objectives:

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

UNIT - 1

Introduction to Block chain

History: Digital Money to Distributed Ledgers, Design Primitives: Protocols, Security, Consensus, Permissions, and Privacy.

UNIT - 2

Block chain Architecture and Design

Basic crypto primitives: Hash, Signature, Hash chain to Block chain, Basic consensus mechanisms

UNIT - 3

Consensus

Requirements for the consensus protocols, Proof of Work (PoW), Scalability aspects of Block chain consensus protocols, Permissioned Block chains: Design goals, Consensus protocols for Permissioned Block chains

UNIT - 4

Hyperledger Fabric

Hyperledger Fabric I: Decomposing the consensus process, Hyperledger fabric components, Chain code Design and Implementation

Hyperledger Fabric II: Beyond Chain code: fabric SDK and Front End, Hyperledger composer tool

UNIT - 5

Use Cases

Use case I: Block chain in Financial Software and Systems (FSS): Settlements, KYC, Capital markets, Insurance.

Use case II: Block chain in tradesupply chain: Provenance of goods, visibility, trade supply chain finance, invoice managementdiscounting, etc

Use case III: Block chain for Government: Digital identity, land records and other kinds of record keeping between government entities, public distribution system social welfare systems

UNIT - 6

Blockchain Cryptography Privacy and Security on Blockchain

Research aspects I: Scalability of Block chain consensus protocols, Case Study “Various recent works on scalability,

Research aspects II: Secure cryptographic protocols on Block chain, Case Study “Secured Multi-party Computation, Block chain for science: making better use of the data-mining network, Case Studies: Comparing Ecosystems - Bitcoin, Hyperledger, Ethereum and more

TEXT/REFERENCE BOOKS

1. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas Antonopoulos
2. Blockchain by Melanie Swa, O'Reilly
3. Hyperledger Fabric - <https://www.hyperledger.org/projects/fabric>
4. Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smits - <https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html>