Madhyanchal Professional University, Bhopal

Program	Faculty	Branch/Specialization
Ph.D	Engineering and Technology	Electronics & Communication Engineering

List of Subjects

S.No	Subject Code	Name of Subject
1	ECEN019902/01	Advanced Digital Signal Processing
2	ECEN019902/02	Advanced Digital Communication
3	ECEN019902/03	Digital Image Processing
4	ECEN019902/04	Optical Integrated Network
5	ECEN019902/05	Advanced Computer Communication
6	ECEN019902/06	Embedded Microcontrollers
7	ECEN019902/07	Wireless networks
8	ECEN019902/08	Advance Antenna Measurements
9	ECEN019902/09	Advance Wireless Communications
10	ECEN019902/10	Advanced Embedded Processor Architecture
11	ECEN019902/11	CMOS Circuit Designs
12	ECEN019902/12	Low Power VLSI Circuits
13	ECEN019902/13	Image and Video Processing
14	ECEN019902/14	Advanced Power System Engineering
15	ECEN019902/15	Power Electronics Applications in Power System
16	ECEN019902/16	Advance Courses in Electrical Machines
17	ECEN019902/17	SCADA Systems

Madhyanchal Professional University, Bhopal

Program	Faculty	Branch/Specialization	Name of Subject	Subject Code
Ph.D	Engineering & Technology	Electronics & Communication Engineering	Advanced Digital Signal Processing	ECEN19902/01

Unit-wise Content distribution

Unit	Contents
Unit-I	Structure for realization of discrete time system: Structure for IIR, state space system analysis and structures representation of numbers-fixed point representation, binary floating point representation, errors resulting from rounding and truncation, quantization of filter coefficient.
Unit-II	Discrete Random Process Expectations variance Co-Variance Scalar Product, Energy of Discrete Signals – Parsevals Theorem, Wiener Khintchine Relation, Power Spectral Density, periodogram- Sample Auto correlation Sum Decomposition Theorem, Spectral Factorization Theorem, Discrete Random Signal Processing by Linear Systems. Simulation of White Noise, Low Pass filtering of White Noise.
Unit-III	Non-Parametric methods-correlation Method, Co-Variance estimator, Performance analysis of Estimators Unbiased, Consistent Estimators Periodogram Estimator-Barlett Spectrum estimation Welch Estimation, a Model based Approach MA, ARMA Signal Modelling – Parameter Estimation using Yule Walker Method.
Unit-IV	Mathematical Description of change of sampling rate, interpolation and decimation continuous time model – Direct digital domain approach – decimation by an integer factor – interpolation by integer factor –single and multistage realization , poly phase realization, application to sub band coding –wavelet transform and filter bank implementation of wavelet expansion of signals.
Unit-V	Adaptive filters based on steepest descent method ,Window Hoff LMS adaptive algorithm – adaptive channel equalization , adaptive echo chancellor – adaptive noise cancellation ,RLS adaptive filters –exponentially weighted RLS-sliding window RLS simplified IIR LMS adaptive filter.

Textbooks/References:

1. *Proakis and Manolakis: Digital Signal Processing, Pearson Education.*
2. *Monson Hayes: Statistical Digital Signal Processing and Modeling, Wiley India Pvt. Ltd.*
3. *Spocles Orfandis: Optimum Signal Processing, TMH.*

Madhyanchal Professional University, Bhopal

Program	Faculty	Branch/Specialization	Name of Subject	Subject Code
Ph.D	Engineering & Technology	Electronics & Communication Engineering	Advanced Digital Communication	ECEN19902/02

Unit-wise Content distribution

Unit	Contents
Unit-I	Power spectral density of digital modulations: Power spectral density of a synchronous data pulse stream generated by a binary, zero mean WSS sequence, cyclostationary sequence, power spectral density of a generalized M-ary markov source, NRZ baseband signaling, RZ baseband signaling, biphase baseband signaling, delay modulation or miller coding.
Unit-II	Digital signaling over a channel with intersymbol, interference and Additive White Gaussian Noise (AWGN) Signal design for band limited channels, optimum demodulation for ISI and additive white gaussian noise, linear equalization, feedback equalization.
Unit-III	Detection: Optimum demodulation for signals with random phase in AWGN, non-coherent detection of binary signal in an AWGN channel, non-coherent detection of M-ary orthogonal signal in an AWGN channel.
Unit-IV	Demodulation and detection of digital modulations 1-Q modulations: unbalanced QPSK, Quadrature Amplitude Modulation (QAM), Quadrature biorthogonal modulation, Continuous phase modulation (CPM): Continuous Phase Frequency Modulation (CPFM), Continuous Phase FSK Minimum Shift Keying (MSK), Sinusoidal Frequency Shift Keying (SFSK), Continuous Phase FPM and QFPM.
Unit-V	Block Coded digital communications: Block coded digital communication system architecture, performance of block coded communication systems, special types of binary block codes: orthogonal binary codes, bi-orthogonal block codes, trans-orthogonal block codes; ensemble of block coded modulation system: performance of the ensemble of binary coded system using BPSK modulation. Q-ary coded M-PSK, shannons channel coding theorem.

Textbooks/References:

1. *Proakis: Digital Communication, TMH*
2. *Taub and Schilling: Principles of Communication Systems, TMH.*
3. *Simon : Digital Communication Techniques, PHI Learning.*
4. *Skylar : Digital Communication, Pearson Education*.

Madhyanchal Professional University, Bhopal

Program	Faculty	Branch/Specialization	Name of Subject	Subject Code
Ph.D	Engineering & Technology	Electronics & Communication Engineering	Digital Image Processing	ECEN19902/03

Unit-wise Content distribution

Unit	Contents
Unit-I	Continuous and discrete images and systems : Light, Luminance, Brightness and Contrast, Eye, The Monochrome Vision Model, Image Processing Problems and Applications, Vision Camera, Digital Processing System, 2-D Sampling Theory, Aliasing, Image Quantization, Lloyd Max Quantizer, Dither, Color Images, Linear Systems and Shift Invariance, Fourier Transform, Z- Transform Matrix Theory Results, Block Matrices and Kronecker Products.
Unit-II	Image transforms : 2-D Orthogonal and Unitary transforms, 1-D and 2-D DFT, Cosine, Sine, Walsh, Hadamard, Haar, Slant, Karhunen- loeve, Singular Value Decomposition Transforms.
Unit-III	Image enhancement : Point Operations – contrast stretching, clipping and thresholding density slicing, Histogram equalization, modification and specification, Spatial operations-spatial averaging, low pass, high pass, band pass filtering, direction smoothing, median filtering, generalized cepstrum and homomorphic filtering, edge enhancement using 2-D IIR and FIR filters, color image enhancement.
Unit-IV	Image restoration : Image observation models, sources of degradation, inverse and Wiener filtering, geometric mean filter, non linear filters, smoothing splines and interpolation, constrained least squares restoration.
Unit-V	Image data compression and image reconstruction from projections : Image data rates, pixel coding, predictive, techniques transform coding and vector DPCM, Block truncation coding, wavelet transform coding of images, color image coding. Random transform, back projection operator, inverse random transform, back projection algorithm, fan beam and algebraic restoration techniques.

Textbooks/References:

1. *Anil Jain: Fundamentals of Digital Image Processing, PHI Learning.*
2. *Sid Ahmed: Image Processing, TMH.*
3. *Gonzalaz and Wintz: Digital Image Processing, Pearson Education.*
4. *William Pratt : Digital Image Processing.*

Madhyanchal Professional University, Bhopal

Program	Faculty	Branch/Specialization	Name of Subject	Subject Code
Ph.D	Engineering & Technology	Electronics & Communication Engineering	Optical Integrated Networks	ECEN19902/04

Unit-wise Content distribution

Unit	Contents
Unit-I	Components for information optics & photonics: Introduction, fabrication techniques for micro optical systems: fabrication methods for optical board level interconnect. Micro optical components for board level optical interconnect: Out-of-plane couplers for optical waveguides in standard FR4 PCBs, 2D single mode fiber array couplers, Intra MCM interconnect module. Fabry Perot model & photonic crystal cavities, recipes for high-Q Fabry perot resonators.
Unit-II	Optical sensors: Optical sensors without waveguide: optical speed sensor, optical shaft encoder, Laser based sensors, Laser for alignment of structures, distance measurement, Laser flaw detection system, Laser dimensional gauge, Laser Doppler velocimeter. Optical sensors with waveguides or optical fiber sensors (OFS): OFS based on intensity modulation: moving reflector type, moving mask type, refractive index modulation type, microbending type. OFS based on phase modulation, OFS based on wavelength modulation, OFS based on frequency modulation, OFS based on polarization modulation, voltage sensor based on Pockel's effect, OFS based on scattering modulation, OFS based on evanescent electric field modulation.
Unit-III	OFS requiring special processing: Interferometry, 2D optical imaging: Photography(basic triangulation method, passive triangulation method, active triangulation method, high speed photography) & Videography, Imaging & Image processing, Optical fiber imaging, optical signal processing- Optical wheatstone bridge, Ratiometric measurement, Interferometric technique, Holography & its mathematical analysis. Applications of Holography: spectroscopy, UV analyzer, IR analyzer, Near IR analyzer. Comparison of Absorption spectrometers, Introduction to integrated optics.
Unit-IV	Limits to optical components Mathematical approach: communication modes, new theorem for strong or multiple scattering, limit to the performance of linear optical components: Explicit limit for 1D systems, slow light limit, limit to dispersion of pulses.
Unit-V	Optical processing with longitudinally decomposed ultrashort optical pulses: Introduction, longitudinal spectral decomposition: theoretical description, practical realization, optical pulse shaping: operating principle, experimental demonstration, distortion from higher order dispersion, waveform detection. High speed optical reflectometry: Introduction, experimental demonstration.

Textbooks/References:

1. *Friberg & Dandliker: Advances in information optics & photonics, PHI Learning.*
2. *Kopeika: System engineering approach to imaging, PHI Learning.*
3. *Shamir: Optical systems & processes, PHI Learning*
4. *Jha: Fiber optic technology: applications to commercial, industrial, military, & space optical systems, PHI Learning*.

Madhyanchal Professional University, Bhopal

Program	Faculty	Branch/Specialization	Name of Subject	Subject Code
Ph.D	Engineering & Technology	Electronics & Communication Engineering	Advanced Computer Communication	ECEN19902/05

Unit-wise Content distribution

Unit	Contents
Unit-I	Review of concepts of Data Communication and Networks. Review of the OSI model, features and functions of different layers, TCP/IP architecture, differences between two models.
Unit-II	Local Area Networks (LAN): Background, topologies and transmission media, LAN protocol architecture, bridges, switches, High speed LAN, Ethernet, Fast Ethernet, Gigabit Ethernet, Token Bus and Token Ring LAN, FDDI.
Unit-III	Wireless LAN (IEEE 802.11): Wireless LAN technology, IEEE 802.11: architecture and services, medium access control, physical layer, security considerations. Internetwork Protocols (IP) Basic protocol function, principles of internetworking, internet protocol IPv6 virtual private network and IP security, multicasting, routing protocols, integrated services architecture, differentiated services, service level agreements, IP performance metrics.
Unit-IV	Transport Protocols Connection oriented transport control mechanisms, Transport Control Protocol (TCP), TCP congestion control, User Datagram Protocol (UDP). Network Security: Security requirements and attacks, confidentiality with conventional encryption, message authentication and hash functions, public key encryption and digital signatures, secure socket layer and transport layer security, IPv4 and IPv6 security, Wi-Fi access.
Unit-V	Internet Applications Electronic Mail: SMTP and MIME, Network management: SNMP, Internet Directory Service: DNS, Web access: HTTP. Multimedia: audio and video compression, real time traffic, voice over IP and multimedia support, Real Time Transport Protocol (RTP).

Textbooks/References:

1. *Stallings: Data and Computer Communications, PHI learning.*
2. *Gupta: Data Communications and Computer Networks, PHI Learning.*
3. *Tannenbaum: Computer Networks, Pearson Education.*

Madhyanchal Professional University, Bhopal

Program	Faculty	Branch/Specialization	Name of Subject	Subject Code
Ph.D	Engineering & Technology	Electronics & Communication Engineering	Embedded Microcontroller	ECEN19902/06

Unit-wise Content distribution

Unit	Contents
Unit-I	Review of 16-bit microprocessor 8086, difference between microprocessor and microcontroller and embedded processor. Types of microcontrollers, examples of some popular microcontrollers, selection criteria of a microcontroller, applications of microcontrollers, basic processing units, microcontroller on-chip resources.
Unit-II	Intel 8051/8031 family microcontroller: Architecture and register organization of 8051, ATMEL 89c51, 8051 pins, 8051 ports, internal and external memory, counters and timers, serial communication, addressing modes, Internal and external interrupts, routine interrupt and interrupt service routine, interrupt handling structure of an MCU, interrupt latency and interrupt deadline, multiple sources of interrupts, enabling and disabling of the sources, polling.
Unit-III	Interfacing of 8051: Interfacing with keyboard, LCD, printer, external memory, automatic control applications, industrial process control system, measurement applications, robotics and embedded control, DSP and digital filters. Development tools for microcontroller applications: Development phases of a microcontroller based system, software development cycle and applications, software development tools IDE, examples of an IDE, emulator, target board, device programmer.
Unit-IV	16-bit microcontrollers: 8096/80196 Family Hardware, memory map, I/O ports, timers, high speed outputs and inputs, interrupts. 32 –bit ARM Family: ARM architecture, ARM7 ARM9, ARM based MCUs, ARM Cortex- M3, Instructions in ARM, exception handling in ARM, development tools.
Unit-V	Motorola MC68HC11/12 Family: Architecture, addressing modes, interfacing methods, interrupts, programmable timer, applications.

Textbooks/References:

1. Raj Kamal: Microcontrollers- architecture, programming, interfacing and system design, Pearson Education.
2. Greg Osborn: Embedded microcontrollers and processor design, Pearson Education.
3. Kanta Rao: Embedded Systems, PHI Learning.

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Program	Faculty	Branch/Specialization	Name of Subject	Subject Code
Ph.D	Engineering & Technology	Electronics & Communication Engineering	Wireless Networks	ECEN19902/07

Unit-wise Content distribution

Unit	Contents
Unit-I	Introduction: PCS architecture, Cellular Telephony, Cordless Telephony and Low-tier PCS, mobility Management: Handoff, Roaming Management, Roaming Management for SS7, Roaming Management for CT2,Handoff management: Detection and Assignment, strategies, channel assignment Handoff management: Radio Link Transfer: Hard and soft Hand off.
Unit-II	Network Signaling: IS-41 Network Signaling, Intersystem Handoff and Authentication in IS-41:handoff measurement, handoff-forward and backward, adaptive algorithm, PACS Network Signaling: Network Elements, Interfaces, registration, intersystem hand off, call origination and termination, Cellular Digital Packet Data ,CDPD architecture, interface, radio resource allocation, roaming management.
Unit-III	GSM System overview: GSM architecture, data services, GSM Network signaling, GSM mobility management: GSM location update, failure restoration, VLR identification algorithm, GSM short message service: SMS architecture, SMS protocol hierarchy, mobile-originated and terminated messaging ,international roaming for GSM,GSM operation, administration and maintenance: call recording functions, performance measurement and management, subscriber and service data management.
Unit-IV	Mobile services Mobile number portability: Mechanisms, VOIP service for mobile Networks: iGSM wireless VoIP solution, iGSM procedures and message flows, mobile prepaid phone services: WIN approach, service node approach, Hot billing approach, hanset based approach, Third generation mobile services: W-CDMA AND CDMA2000.
Unit-V	Wireless Protocols: Wireless application protocol, Heterogeneous PCS, paging systems: network architecture, interfaces, Wireless Local Loop: architecture, technologies, Wireless enterprise networks: enterprise telephony, location systems, Bluetooth, enterprise PCS, GPRS: architecture, network nodes, interfaces, procedures,

Textbooks/References:

1. *Yi-Bing Lin: Wireless and Mobile Network Architectures, Wiley India Pvt Ltd.*
2. *Nicopolitidis: Wireless networks, Wiley India Pvt Ltd.*
3. *Haykin: Mordern Wireless Communication, Pearson Education.*
4. *Rappaport: Wireless Communications, Pearson Education*.

Madhyanchal Professional University, Bhopal

Program	Faculty	Branch/Specialization	Name of Subject	Subject Code
Ph.D	Engineering & Technology	Electronics & Communication Engineering	Advanced Antenna Measurements	ECEN19902/08

Unit-wise Content distribution

Unit	Contents
Unit-I	**Antenna Pattern Measurements**: Basic Considerations, Pattern Formats, Fresnel Region Measurements, Modeling Techniques.
Unit-II	**Antenna Range Design and Evaluation**: Introduction, Electromagnetic Design Consideration, Antenna Range Evaluation.
Unit-III	**Antenna Testing**: Introduction, Types of Ranges: Elevated Ranges, Ground Ranges, Near Field Ranges, Radar Cross Section Ranges.
Unit-IV	**Far Field Range Design** : Introduction, Designing the Range, Source Design, Receiving Site Design, Ground Ranges. **Far Field Antenna Tests**: Introduction, Pattern Testing, Gain and Directivity, Polarization. **Far Field Pattern Errors**: Introduction, Error Estimates, Error Correction, Antenna Errors.
Unit-V	**Compact Ranges**: Introduction, Room Design, Feed Design, Reflector Design. **Near Filed Testing**: Introduction, Planar Near Field Ranges, Errors, Cylindrical and Spherical Scanning.

Textbooks/References:

1. Evans, Gray E," Antenna measurement Techniques", Artech House, Inc
2. J S Hollis, T J Lyon, L Clayton," Microwave Antenna Measurements" , Scientific Atlants, Inc.

Madhyanchal Professional University, Bhopal

Program	Faculty	Branch/Specialization	Name of Subject	Subject Code
Ph.D	Faculty of Engineering & Technology	Electronics & Communication Engineering	Advanced Wireless Communication	ECEN19902/09

Unit-wise Content distribution

Unit	Contents
Unit-I	**MOBILE COMMUNICATION** Cellular Concept: Cell Area, Signals Strength and Cell Parameters, Capacity of a Cell, Frequency Reuse, Co channel Interference, Cell Splitting, Cell Sectoring.Multiple Radio Access: Multiple Radio Access Protocols, Contention Based Protocols. Multiple Division Techniques For traffic Channel: Concept and Model for Multiple Divisions, Modulation Techniques.
Unit-II	Traffic Channel Allocation, Mobile Communication Systems: Cellular System Infrastructure,Registration, Handoff Parameters and Underlying Support, Roaming Support, Multicasting.Existing Wireless Systems: AMPS- characteristics, Operation, General Working; GSM- GSM frequency Band, GSM LMN, Objectives, Services, Interfaces;IMT-2000 – International Spectrum Allocation, Services Provided By 3rd Generation Cellular Systems, Harmonized 3G Systems.Next Generation Cellular Technology 4G,5G: Evolution, Objectives, Advantages and Limitation Of 4G And 5G Network Technology Over 3G,Applications,4G Technologies,5G Technologies, Smart Antenna Technique.
Unit-III	**WIRELESS COMMUNICATION** Multiple Access and Channels: Orthogonal Frequency Division Multiplexing (OFDM), OFDMA, Fading channels, Multiple Input and Multiple Output (MIMO).
Unit-IV	Mobile Adhoc Network(MANet) : Infrastructure less network, Medium access Protocols for MANet, Routing Protocols, Wireless Sensor Networks: Distributed Sensing Nodes, Power saving medium access protocols, IEEE 808.15.4, Network attacks mitigation in MANet.
Unit-V	Cognitive Radio Network (CRN): Spectrum Sensing Techniques: Energy Detector, Cyclostationary Detector, Marched Filter Detector, Radio Identification Detector, Cyclo-Energy Detector etc. Cooperative spectrum Sensing: Data and Decision cooperative spectrum sensing, Fusion Center, Spectrum Allocation Techniques, Network attacks mitigation in CRN, IEEE 802.22 (WRAN). Wireless Access Networks: WLAN, IEEE 802.11, WiMAX, IEEE 802.16, LTE, Ultra Wide-Band (UWB).

Textbooks/References:

1. Dharma Prakash Agrawal and Qing-An Zeng, “Introduction to Wireless and Mobile System”.
2. Vijay K. Garg and Joseph E. Wilkes ,“Principles and Applications of GSM”,.
3. Gottapu Sasibhushana Ra, “Mobile Cellular Communication”.
4. “Wireless Communications:Principles and Practice”, by T.S. Rappaport, Prentice Hall publication.
5. “Introduction to Wireless and Mobile Systems”, by Dharma Prakash Agrawal, Qing-An Zeng, Cengage Learning publication.
6. “Ad Hoc Networking”, by Perkins, Pearson publication, 2008 Edition
7. “Ad Hoc Mobile Wireless Networks”, by Sudhir K. Sarkar, T.G. Basavraju, C. Puttamadappa, CRC publication.
8. “A survey of spectrum sensing algorithms for cognitive radio Applications”, Tevfik Yucek, Huseyin Arslan, IEEE communications survey & tutorials, vol. 11, no. 1, 2009, pp. 116-129.
9. “Cyclo-energy detector for spectrum sensing in cognitive radio”, Lei Yang, Zhe Chen, Fuliang Yin, International Journal of Electronics and Communications (AEÜ), 66 (2012), pp. 89-92.
10. “Wireless and Cellular Communications”, by William C.Y. Lee, McGRAW-HILL Publication

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Program	Faculty	Branch/Specialization	Name of Subject	Subject Code
Ph.D	Engineering & Technology	Electronics & Communication Engineering	Advanced Embedded Processor Architecture	ECEN19902/10

Unit-wise Content distribution

Unit	Contents
Unit-I	**ARM Processor as System-on-Chip:** Acorn RISC Machine – Architecture inheritance – ARM programming model. 3 and 5 stage pipeline ARM organization – ARM instruction execution and implementation – ARM Co-processor interface.
Unit-II	**ARM Assembly Language Programming:** ARM instruction types – data transfer, data processing and control flow instructions – ARM instruction set – Co-processor instructions, Thumb Instruction Set.
Unit-III	**Architectural Support for System Development:** Advanced Microcontroller bus architecture – ARM memory interface – ARM reference peripheral specification – Hardware system prototyping tools – ARMulator – Debug architecture.
Unit-IV	**ARM Processor Cores:** ARM7TDMI, ARM8, ARM9TDMI, ARM10TDMI, the AMULET Asynchronous ARM Processors- AMULET1.
Unit-V	**Embedded ARM Applications**: The VLSI Ruby II Advanced Communication Processor, The VLSI ISDN Subscriber Processor, The OneC™ VWS22100 GSM chip, The Ericsson-VLSI, Bluetooth Baseband Controller, The ARM7500 and ARM7500FE.

Textbooks/References:

1.ARM System on Chip Architecture – Steve Furber – 2nd ed., 2000, Addison Wesley Professional.
2.Design of System on a Chip: Devices and Components – Ricardo Reis, 1st ed., 2004, Springer.
3.Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology) – Jason Andrews – Newnes, BK and CDROM.
4.System on Chip Verification – Methodologies and Techniques –Prakash Rashinkar, Peter Paterson and Leena Singh L, 2001, Kluwer Academic Publisher.

Madhyanchal Professional University, Bhopal

Program	Faculty	Branch/Specialization	Name of Subject	Subject Code
Ph.D	Engineering & Technology	Electronics & Communication Engineering	CMOS Circuit Design	ECEN19902/11

Unit-wise Content distribution

Unit	Contents
Unit-I	**Introduction:** Classification of CMOS digital circuits and Circuit design, Overview of VLSI design methodologies, VLSI design flow, Design hierarchy and concepts, VLSI design styles, Design quality, Packing technology, CAD technology, Fabrication process flow, CMOS n-well process, layout design rules.
Unit-II	**MOS Transistor and Circuit Modeling:** MOS structure, MOS system under external bias, structure and operation of MOS transistor, MOSFET current-voltage characteristics, MOSFET scaling and small-geometry effects, MOSFET capacitances, Modeling of MOS transistor using SPICE.
Unit-III	**MOS Inverter static characteristics and Interconnect Effects:** Introduction, Resistive-Load Inverter, Inverter with n-type MOSFET load, CMOS Inverter, Delay-Time Definitions, Calculation of Delay Times, Inverter Design with Delay Constraints, Estimation of Interconnect Parasitics, Calculation of Interconnect Delay, Switching Power Dissipation of CMOS Inverters.
Unit-IV	**Combinational and Sequential MOS logic Circuits:** Introduction, MOS logic circuits with depletion nMOS loads, CMOS logic Circuits, Complex logic circuits, CMOS transmission gates (Pass gates), Behavior of bi-stable elements, SR latch circuit, clocked latch and flip-flop circuits, CMOS D-latch and Edge-triggered flip-flop.
Unit-V	**Dynamic logic Circuits:** Basic principles of pass transistor circuits, voltage bootstrapping, synchronous dynamic circuit techniques, Dynamic CMOS circuit techniques, High-performance dynamic CMOS circuits.

Textbooks/References:

1.Sung-Mo Kang, Yusuf Leblebici, “CMOS Digital Integrated Circuits” TMH 2003.
2.Neil H. E. Weste and David. Harris Ayan Banerjee,, “CMOS VLSI Design” - Pearson Education, 1999.
3.Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, “Digital Integrated Circuits” Pearson Education, 2003
4.Uyemura, “Introduction to VLSI Circuits and Systems” Wiley-India, 2006.
5.Wayne Wolf, “Modern VLSI Design ", 2nd Edition, Prentice Hall, 1998.
6.Kamran Ehraghian, Dauglas A. Pucknell and Sholeh Eshraghiam, “Essentials of VLSI Circuits and Systems” – PHI, EEE, 2005 Edition.
7.Etienne Sicard, Sonia Delmas Bendhia, “Basics of CMOS Cell Design”, TMH, EEE, 2005.

Madhyanchal Professional University, Bhopal

Program	Faculty	Branch/Specialization	Name of Subject	Subject Code
Ph.D	Engineering & Technology	Electronics & Communication Engineering	Low Power VLSI Circuits	ECEN19902/12

Unit-wise Content distribution

Unit	Contents
Unit-I	**Introduction:** Need for low power VLSI chips, Sources of power dissipation on Digital Integrated circuits. Emerging Low power approaches. **Device & Technology Impact on Low Power:** Dynamic dissipation in CMOS, Transistor sizing& gate oxide thickness, Impact of technology Scaling, Technology & Device innovation.
Unit-II	**Simulation Power analysis**: SPICE circuit simulators, gate level logic simulation, capacitive power estimation, static state power, gate level capacitance estimation, architecture level analysis, data correlation analysis in DSP systems, Monte Carlo simulation.
Unit-III	**Probabilistic power analysis**: Random logic signals, probability & frequency, probabilistic power analysis techniques, signal entropy. **Low Power Circuit's**: Transistor and gate sizing, network restructuring and Reorganization. Special Flip Flops & Latches design, high capacitance nodes, low power digital cells library.
Unit-IV	**Logic level:** Gate reorganization, signal gating, logic encoding, state machine encoding, pre-computation logic. **Low power Architecture & Systems:** Power & performance management, switching activity reduction, parallel architecture with voltage reduction, flow graph transformation, low power arithmetic components.
Unit-V	**Low power Clock Distribution:** Power dissipation in clock distribution, single driver Vs distributed buffers, Zero skew Vs tolerable skew, chip & package co design of clock network. **Special Techniques**: Power Reduction in Clock networks, CMOS Floating Node, Low Power Bus Delay balancing, and Low Power Techniques for SRAM.

Textbooks/References:

1.Gary K. Yeap, "Practical Low Power Digital VLSI Design", KAP, 2002
2.Rabaey, Pedram, "Low Power Design Methodologies" Kluwer Academic
3.Kaushik Roy, Sharat Prasad, "Low-Power CMOS VLSI Circuit Design" Wiley, 2000
4.Yeo, "CMOS/BiCMOS ULSI Low Voltage Low Power" Pearson Education
5. Kamran Ehraghian, Dauglas A. Pucknell and Sholeh Eshraghiam, "Essentials of VLSI Circuits and Systems" – PHI, EEE, 2005 Edition.
6. Etienne Sicard, Sonia Delmas Bendhia, "Basics of CMOS Cell Design", TMH, EEE, 2005.

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Program	Faculty	Branch/Specialization	Name of Subject	Subject Code
Ph.D	Engineering & Technology	Electronics & Communication Engineering	Image And Video Processing	ECEN19902/13

Unit-wise Content distribution

Unit	Contents
Unit-I	**Fundamentals of Image processing and Image Transforms:** Basic steps of Image processing system sampling and quantization of an Image – Basic relationship between pixels Image Transforms: 2 – D Discrete Fourier Transform, Discrete Cosine Transform (DCT), Discrete Wavelet transforms.
Unit-II	**Image Processing Techniques:** Image Enhancement: Spatial Domain methods: Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial filters, Sharpening Spatial filters Frequency Domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, selective filtering Image Segmentation: Segmentation concepts, point, line and Edge detection, Thresholding, region based segmentation.
Unit-III	**Image Compression** Image compression fundamentals – coding Redundancy, spatial and temporal redundancy. Compression models : Lossy and Lossless, Huffmann coding, Arithmetic coding, LZW coding, run length coding, Bit Plane coding, transform coding, predictive coding , wavelet coding, JPEG standards.
Unit-IV	**Basic Steps of Video Processing:** Analog video, Digital Video, Time varying Image Formation models : 3D motion models, Geometric Image formation , Photometric Image formation, sampling of video signals, filtering operations.
Unit-V	**2-D Motion Estimation:** Optical flow, general methodologies, pixel based motion estimation, Block matching algorithm, Mesh based motion Estimation, global Motion Estimation, Region based motion estimation, multi resolution motion estimation. Waveform based coding, Block based transform coding, predictive coding, Application of motion estimation in video coding.

Textbooks/References:

1.Gonzalez and Woods , “Digital Image Processing”, 3rd edition , Pearson

2.Yao wang, Joem Ostarmann and Ya – quin Zhang, “Video processing and communication”, 1st edition, PHI.
3.M. Tekalp, “Digital video Processing”, Prentice Hall International
4.Relf, Christopher G.,"Image acquisition and processing with LabVIEW", CRC press

5.Aner ozdemi R, "Inverse Synthetic Aperture Radar Imaging with MATLAB Algorithms", John Wiley & Sons.

6.Chris Solomon, Toby Breckon ,"Fundamentals of Digital Image Processing A Practical Approach with Examples in Matlab", John Wiley & Sons.

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Program	Faculty	Branch/Specialization	Name of Subject	Subject Code
Ph.D	Engineering & Technology	Electronics & Communication Engineering	Advanced Power System Engineering	ECEN19902/14

Unit-wise Content distribution

Unit	Contents
Unit-I	INTRODUCTION TO POWER SYSTEM STABILITY PROBLEM: Basic concepts and definitions: Rotor angle stability, voltage stability and voltage collapse, Midterm and long-term stability, Classification of stability, states of operation and system security system dynamic problems. REVIEW OF CLASSICAL METHOD: System model, some mathematical analysis of steady state stability, analysis of transient stability, simplified representation of excitation control.
Unit-II	MODELING OF SYNCHRONOUS MACHINE: Introduction, synchronous machine, parks transformation, analysis of steady state performance per unit equivalent circuits of synchronous machine, determination of parameters of equivalent circuits, measurements for obtaining data, saturation models, transient analysis of a synchronous machine EXCITATION AND PRIME MOVER CONTROLLERS: Excitation system Modeling, system representation by state evasions, prime move control systems.
Unit-III	TRNMISSION LINE, SVC AND LOADS: D-Q transformation using L-B variables, static var compensators, loads Dynamics of a synchronous generator connected to estimate bus: system model, synchronous machine model, calculation of initial conditions, inclusion of SVC Model, Analysis of single machine system, Small signal analysis with block diagram representation, synchronizing and damping torque analysis, small signal model, nonlinear oscillators. APPLICATION OF POWER SYSTEM STABILIZERS: Basic concepts, control signals, structure and tuning of PSS, field implementation and operating experience 8 Hours.
Unit-IV	Protective Relays: Relaying review, characteristics and operating equations of relays. CT's and PT's differential relay, over-current relay, reverse power relay, distance relays, applications of relays. STATIC RELAYS: Introduction, advantages and disadvantages, classification logic ckts, smoothing circuits, voltage regulator square wave generator, time delay ckts level detectors, summation device, sampling circuit, zero crossing detector, output devices. COMPARATORS: Replica Impedance, mixing transformers, general equation of phase and amplitude comparator, realization of ohm, impedance and off set impedance characteristics, duality principle, static amplitude comparators, coincidence circuit, Hall effect devices, Magneto receptivity, zener diode phase comparator multi input comparators.
Unit-V	Generator and transformer protection: Protective devices for system. Protective devices for stator, rotor, and prime mover of generator, percentage differential relays protection, three winding transformer protection, earth fault protection, generator transformer unit protection. Bus bar and transmission line protection: Distance protective schemes, directional wave detection relay. Phase compensation carrier protection. High impedance differential scheme, supervisory and check relay, Some features of 500 KV relaying protection. Modern trends in power system protection: Different types of digital and computer aided relays, Microprocessor based relays, auto-reclosing, frequency relays, under and over frequency relays, di/dt relays. Algorithms for transmission line, transformer & bus bar protection; out-of-step relaying Introduction to adaptive relaying & wide area measurements

Textbooks/References:

1. K.R. Padiyar, Power system dynamics, stability and control, BS Pub. Hydbd
2. P Kunder, Power system stability and control, TMH.
3. P. W. Sauer & M A Pai: Power system dynamics and stability: Pearson.
4. Power System Protection and Switchgear, B.Ram – Tata Mc-Graw Hill Pub.
5. Switchgear and Protection, M.V.Deshpande - Tata Mc-Graw Hill Pub.
6. Power System Protection & Switchgear, Ravindra Nath, M.Chander, Willy P

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Program	Faculty	Branch/Specialization	Name of Subject	Subject Code
Ph.D	Engineering & Technology	Electronics & Communication Engineering	Applications of Power Electronics in Power System	ECEN19902/15

Unit-wise Content distribution

Unit	Contents
Unit-I	Power System components models formation of bus admittance matrix, algorithm for formation of bus impedance matrix. Reactive power capability of an alternator, transmission line model & loadability, Reactive power transmission & associated difficulties, Regulated shunt compensation, Models of OLTC & Phase shifting transformer, load flow study.
Unit-II	Sensitivity analysis: Generation shift distribution factors, line outage distribution factors, Compensated shift factors. Power systems security levels, contingency selection & evaluation, security constrained economic dispatch. Pre-contingency corrective rescheduling.
Unit-III	Voltage stability: Proximity indicators e.g. slope of PV curve, Minimum Eigen value of reduced load flow Jacobian participation factors based on modal analysis and application.
Unit-IV	Flexible ac transmission system, reactive power control, brief description and definition of FACT's controllers, shunt compensators, configuration and operating characteristics of TCR, FC-TCR, TSC, Comparisons of SVCs
Unit-V	Thy thyristor controlled series capacitor (TCSC) Advantages of the TCSC, Basic principle and different mode of operation, analysis variable reactance model and transient stability model of TCSC.

Textbooks/References:

1. Modern power system analysis D.P. Kothari, I.J. Nagrath, TMH, 2003
2. Power generation operation and control, A.J. Wood, B.F Woolenberg, John W
3. Understanding facts: Concepts and technologies of flexible AC transmission system IEEE Press, 2001 N.G. Hingorani, L. Gyugyi
4. Power system stability and control IEEE press P. Kundur, 1994
5. Thyristor Based FACTS controllers for electrical Transmission systems- R.M. Mathur, R.K. Verma, Wieldy inter science, 2002

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Program	Faculty	Branch/Specialization	Name of Subject	Subject Code
Ph.D	Engineering & Technology	Electronics & Communication Engineering	Advance Course in Electrical Machines	ECEN19902/16

Unit-wise Content distribution

Unit	Contents
Unit-I	Review: Primitive machine, voltage and torque equation. Concept of transformation, change of variables, m/c variables and transform variables. Application to D.C. machine for steady state and transient analysis, equation of cross field commutator machine
Unit-II	Induction Machine: Voltage, torque equation for steady state operation, Equivalent circuit, Dynamic performance during sudden changes in load torque and three phase fault at the machine terminals. Voltage & torque equation for steady state operation of 1-ö induction motor & scharge motor.
Unit-III	Synchronous Machine: Transformation equations for rotating three phase windings, Voltage and power equation for salient and non salient alternator, their phasor diagrams, Simplified equations of a synchronous machine with two damper coils.
Unit-IV	Operational Impedances and Time Constants of Synchronous Machines : Park's equations in operational form, operational impedances and G(P) for a synchronous machine with four Rotor Windings, Standard synchronous machine Reactances, time constants, Derived synchronous machine time constants, parameters from short circuit characteristics.
Unit-V	Approximate Methods for Generator & System Analysis: The problem of power system analysis, Equivalent circuit & vector diagrams for approximate calculations, Analysis of line to line short circuit, Application of approximate method to power system analysis.

Textbooks/References:

1. Analysis of Electric Machinery - P.C.Krause
2. The General theory of Electrical Machines - B.Adkins
3. The General theory of AC Machines - B.Adkins & R.G.Harley
4. Generalised theory of Electrical m/c - P.S.Bhimbra
5. Electro Mechanical Energy Conversion - White & Woodson

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Program	Faculty	Branch/Specialization	Name of Subject	Subject Code
Ph.D	Engineering & Technology	Electronics & Communication Engineering	SCADA Systems	ECEN19902/17

Unit-wise Content distribution

Unit	Contents
Unit-I	SCADA SYSTEM: Need of computer control of power systems, Data acquisition and control, SCADA System evolution, SCADA System architecture, SCADA System desirable properties, Remote Terminal Unit- RTU Principle, Test and configuration tools for RTU, SCADA human – machine interface (HMI)
Unit-II	SCADA COMMUNICATION - Transducers- Analog and Digital transducers, Digital data acquisition systems, Signal conditioning system, Data telemetry- Voltage and current telemetry, Position telemetry , radio frequency telemetry, Transmission channels and media
Unit-III	SCADA Protocols- Evolution of SCADA Protocols, Proprietary and open protocols , OSI Model, TCP/IP Model, Modbus, DNP3, UCA, IEC 61850 Standards, SCADA security system
Unit-IV	Automatic Substation Control and Distribution Automation : Topology and functionality, hardware implementation , system configuration and testing, Factors influencing the application of automation of distribution networks, Primary and secondary distribution network automation, Autoreclosers , Sectionalizers , Ring Main Units (RMU) ,Fault passage Indicators (FPI)
Unit-V	Smart Grid- Principle and architecture of Smart Grid, Self healing and adaptive grids, Key drivers, components of smart grid, smart grid management center, Advance metering infrastructure for smart grid , Zigbee and home area network (HAN), Phasor measurement unit (PMU), smart grid security , India's initiative and development toward smart grid , challenges in smart grid implementation.

Textbooks/References:

1. SCADA: Supervisory Control and Data Acquisition - Stuart A. Boyer , ISA publisher
2. Practical Modern SCADA Protocols-Gordon Clarke and Deon Reynders, Newnes publisher
3. Cybersecurity for SCADA Systems-William T Shaw , PennWell Books
4. GIS - SCADA Integration: Approach for Power Distribution-Priyanka Verma and Sumit Verma , LAP Lambert Academic Publishing
5. Securing SCADA Systems-Ronald L. Krutz, John Wiley & Sons
6. Designing SCADA Application Software-Stuart G. McCrady, Elsevier Science Publishing Co Inc
7. Control and Automation of Electrical Power Distribution Systems- James Northcote- Green and Robert G. Wilson , CRC Press
8. Smart Grid Fundamentals of design and analysis - James Momoh, Wiley-Blackwell publisher