SCHEME – SEMESTER WISE COURSE ALLOCATION

First Semester Syllabus

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1.	PCC	CEC101	Advanced Communication Networks	3	0	0	3
2.	PCC	CEC102	Wireless and Mobile Communication	3	0	0	3
3.	DE	Prog. Specific Elective	Specialization Elective-I	3	0	0	3
4.	DE	Prog. Specific Elective	Specialization Elective-II	3	0	0	3
5.		Lab 1	Advanced Communication Networks Lab	0	0	4	2
6.		Lab 2	Wireless and Mobile Communication Lab	0	0	4	2
7.			Research Methodology and IPR	2	0	0	2
8.	OE	Aud I	Audit Course I	2	0	0	0
			Total	16	0	8	18

Suggestive Choice Based Subjects

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1.	DE	CED103	Wireless Sensor Networks	3	0	0	3
2.	DE	CED104	Optical Networks	3	0	0	3
3.	DE	CED105	Statistical Information Processing	3	0	0	3
4.	DE	CED106	Cognitive Radio	3	0	0	3
5.	DE	CED107	RF and Microwave Circuit Design	3	0	0	3
6.	DE	CED108	DSP Architecture	3	0	0	3
7.	OE	Aud I	Audit Course I: English for Research Paper Writing	2	0	0	0
8.	OE	Aud I	Audit Course I: Disaster Management	2	0	0	0
9.	OE	Aud I	Audit Course I: Sanskrit for Technical Knowledge	2	0	0	0
10.	OE	Aud I	Audit Course I: Value Education	2	0	0	0

First Semester Syllabus

TITLE OF COURSE: ADVANCED COMMUNICATION NETWORKS
COURSE CODE: CEC101
L-T-P: 3-0-0
CREDITS: 3

Course Outcomes (CO):

Upon successful completion of this course, students should be able to:
CO1: Understand advanced concepts in Communication Networking.
CO2: Design and develop protocols for Communication Networks.
CO3: Understand the mechanisms in Quality of Service in networking.
CO4: Optimize the Network Design.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓		✓						✓	✓
CO2	✓			✓							✓	✓
CO3	✓	✓	✓								✓	✓
CO4	✓	✓	✓		✓						✓	✓

Course Contents:

Unit 1: Overview of Internet-Concepts, challenges and history. Overview of -ATM. TCP/IP Congestion and Flow Control in Internet-Throughput analysis of TCP congestion control. TCP for high bandwidth-delay networks. Fairness issues in TCP.

Unit 2: Real Time Communications over the Internet. Adaptive applications. Latency and throughput issues. Integrated Services Model (intServ). Resource reservation on the Internet. RSVP.; Characterization of Traffic by Linearly Bounded Arrival Processes (LBAP). Leaky bucket algorithm and its properties.

Unit 3: Packet Scheduling Algorithms-requirements and choices. Scheduling guaranteed service connections. GPS, WFQ and Rate proportional algorithms. High-speed scheduler design. Theory of Latency Rate servers and delay bounds in packet-switched networks for LBAP traffic.; Active Queue Management - RED, WRED and Virtual clock. Control theoretic analysis of active queue management.

Unit 4: IP address lookup challenges. Packet classification algorithms and Flow Identification- Grid of Tries, Cross producing and controlled prefix expansion algorithms

Unit 5: Admission control on the Internet. Concept of Effective bandwidth. Measurement-based admission control. Differentiated Services on the Internet (DiffServ). DiffServ architecture and framework.

Unit 6: IPV4, IPV6, IP tunnelling, IP switching and MPLS, Overview of IP over ATM and its evolution to IP switching. MPLS architecture and framework. MPLS Protocols. Traffic engineering issues in MPLS.

References:

- Jean Wairand and Pravin Varaiya, “High-Performance Communications Networks”, 2nd edition, 2000.
- Jean Le Boudec and Patrick Thiran, “Network Calculus A Theory of Deterministic Queueing Systems for the Internet”, Springer Veriag, 2001.
- Zhang Wang, “Internet QoS”, Morgan Kaufman, 2001.
- Anurag Kumar, D. Manjunath and Joy Kuri, “Communication Networking: An Analytical Approach”, Morgan Kaufman Publishers, 2004.
- George Kesidis, “ATM Network Performance”, Kluwer Academic, Research Papers, 2005

TITLE OF COURSE: WIRELESS AND MOBILE COMMUNICATION
COURSE CODE: CEC102
L-T-P: 3-0-0
CREDITS: 3

Course Outcomes (CO):
Upon successful completion of this course, students should be able to:
CO1: Design appropriate mobile communication systems.
CO2: Apply frequency-reuse concept in mobile communications and analyze its effects on interference, system capacity, handoff techniques
CO3: Distinguish various multiple-access techniques for mobile communications, e.g., FDMA, TDMA, CDMA, and their advantages and disadvantages.
CO4: Analyze path loss and interference for wireless telephony and their influence on the performance of a mobile communication system.
CO5: Analyze and design CDMA system functioning with knowledge of forward and reverse channel details, advantages and disadvantages of using the technology channel details, advantages and disadvantages of using the technology.
CO6: Understanding upcoming technologies like 3G, 4G, etc.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓		✓		✓				✓		✓
CO2	✓		✓		✓	✓				✓		✓
CO3	✓		✓		✓	✓	✓			✓		✓
CO4	✓		✓		✓	✓	✓			✓		✓
CO5	✓		✓		✓	✓	✓			✓		✓
CO6	✓		✓		✓		✓					✓
							✓					

Course Contents:

Unit 1: Cellular Communication Fundamentals: Cellular system design, Frequency reuse, cell splitting, handover concepts, Co-channel and adjacent channel interference, interference reduction techniques and methods to improve cell coverage, Frequency management, and channel assignment.GSM architecture and interfaces, GSM architecture details, GSM subsystems, GSM Logical Channels, Data Encryption in GSM, Mobility Management, Call Flows in GSM.2.5 G Standards: High-speed Circuit Switched Data (HSCSD), General Packet Radio Service (GPRS), 2.75 G Standards: EDGE,

Unit 2: Spectral efficiency analysis based on calculations for Multiple access technologies: TDMA, FDMA, and CDMA, Comparison of these technologies based on their signal separation techniques, advantages, disadvantages, and application areas.Wireless network planning (Link budget and power spectrum calculations)

Unit 3: Mobile Radio Propagation: Large Scale Path Loss, Free Space Propagation Model, Reflection, Ground Reflection (Two-Ray) Model, Diffraction, Scattering, Practical Link Budget Design using Path Loss Models, Outdoor Propagation Models, Indoor Propagation Models, Signal Penetration into Buildings. Small Scale Fading and Multipath Propagation, Impulse Response Model, Multipath Measurements, Parameters of Multipath channels, Types of Small Scale Fading: Time Delay Spread; Flat, Frequency selective, Doppler Spread; Fast and Slow fading**.**

Unit 4: Equalization, Diversity: Equalizers in a communications receiver, Algorithms for adaptive equalization, diversity techniques, space, polarization, frequency diversity, Interleaving.

Unit 5: Code Division Multiple Access: Introduction to CDMA technology, IS 95 system Architecture, Air Interface, Physical and logical channels of IS 95, Forward Link and Reverse link operation, Physical and Logical channels of IS 95 CDMA, IS 95 CDMA Call Processing, soft Handoff, Evolution of IS 95 (CDMA One) to CDMA 2000, CDMA 2000 layering structure and channels.

Unit 6: Higher Generation Cellular Standards:3G Standards: evolved EDGE, enhancements in 4G standard, Architecture and representative protocols, call flow for LTE, VoLTE, UMTS, introduction to 5G.

References

- V.K.Garg, J.E.Wilkes, "Principle and Application of GSM," Pearson Education, 5th edition, 2008.
- V.K.Garg, "IS-95 CDMA & CDMA 2000", Pearson Education, 4th edition, 2009.
- T.S.Rappaport, "Wireless Communications Principles and Practice," 2nd edition, PHI,2002.
- William C.Y.Lee, "Mobile Cellular Telecommunications Analog and Digital Systems," 2nd edition, TMH, 1995.
- Asha Mehrotra, "A GSM system Engineering" Artech House Publishers Bosten, London,1997.

TITLE OF COURSE: WIRELESS SENSOR NETWORKS
COURSE CODE: CED103
L-T-P: 3-0-0
CREDITS: 3

Course Outcomes (CO):

CO1: Design wireless sensor network system for different applications under consideration.
CO2: Understand the hardware details of different sensors and select the right type of sensor for various applications.
CO3: Understand radio standards and communication protocols to be used for wireless sensor network-based systems and applications.
CO4: Use operating systems and programming languages for wireless sensor nodes, the performance of wireless sensor networks systems and platforms.
CO5: Handle special issues related to sensors like energy conservation and security challenges.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓		✓							✓
CO2	✓			✓			✓	✓				✓
CO3	✓	✓	✓				✓	✓				✓
CO4	✓	✓	✓		✓							✓
CO5	✓	✓	✓		✓							✓

Course Contents:

Unit 1: Introduction and overview of sensor network architecture and its applications, sensor network comparison with Ad Hoc Networks, Sensor node architecture with hardware and software details.

Unit 2: Hardware: Examples like mica2, micaZ, telosB, cricket, Imote2, tmote, btnode, and Sun SPOT, Software (Operating Systems): tinyOS, MANTIS, Contiki, and RetOS.

Unit 3: Programming tools: C, nesC. Performance comparison of wireless sensor networks simulation and experimental platforms like open source (ns-2) and commercial (QualNet, Opnet)

Unit 4: Overview of sensor network protocols (details of at least two important protocols per layer): Physical, MAC and routing/ Network layer protocols, node discovery protocols, multi-hop, and cluster-based protocols, Fundamentals of 802.15.4, Bluetooth, BLE (Bluetooth low energy), UWB.

Unit 5: Data dissemination and processing; differences compared with other database management systems, data storage; query processing.

Unit 6: Specialized features: Energy preservation and efficiency; security challenges; fault- tolerance, Issues related to Localization, connectivity and topology, Sensor deployment mechanisms; coverage issues;

sensor Web; sensor Grid, Open issues for future research, and Enabling technologies in the wireless sensor network.

Reference:

- H. Karl and A. Willig, “Protocols and Architectures for Wireless Sensor Networks”, John Wiley & Sons, India, 2012.
- C. S. Raghavendra, K. M. Sivalingam, and T. Znati, Editors, “Wireless Sensor Networks”, Springer Verlag, 1st Indian reprint, 2010.
- F. Zhao and L. Guibas, “Wireless Sensor Networks: An Information Processing Approach”, Morgan Kaufmann, 1st Indian reprint, 2013.
- YingshuLi, MyT. Thai, Weili Wu, “Wireless sensor Network and Applications”, Springer series on signals and communication technology, 2008.

TITLE OF COURSE: OPTICAL NETWORKS
COURSE CODE: CED104
L-T-P: 3-0-0
CREDITS: 3

Course Outcomes (CO):

Upon successful completion of this course, students should be able to:
CO1: Contribute in the areas of optical network and WDM network design.
CO2: Implement a simple optical network and understand further technology developments for the future enhanced network.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓		✓							✓
CO2	✓			✓								✓

Course Contents:

Unit 1: SONET/SDH: optical transport network, IP, routing, forwarding, multiprotocol label switching.

Unit 2: WDM network elements: optical line terminals and amplifiers, optical add/drop multiplexers, OADM architectures, reconfigurable OADM, optical cross-connects.

Unit 3: Control and management: network management functions, optical layer services, and interfacing, performance and fault management, configuration management, optical safety.

Unit 4: Network Survivability: protection in SONET/SDH & client layer, optical layer protection schemes.

Unit 5: WDM network design: LTD and RWA problems, dimensioning wavelength routing networks, statistical dimensioning models.

Unit 6: Access networks: Optical time division multiplexing, synchronization, header processing, buffering, burst switching, testbeds, Introduction to PON, GPON, AON.

Reference:

• Rajiv Ramaswami, Sivarajan, Sasaki, “Optical Networks: A Practical Perspective”, MK, Elsevier, 3 rd edition, 2010.
• C. Siva Ram Murthy and Mohan Gurusamy, “WDM Optical Networks: Concepts Design, and Algorithms”, PHI, EEE, 2001.

TITLE OF COURSE: STATISTICAL INFORMATION PROCESSING
COURSE CODE: CED105
L-T-P: 3-0-0
CREDITS: 3

Course Outcomes (CO):
At the end of this course, students will be able to
CO1: Characterize and apply probabilistic techniques in modern decision systems, such as information systems, receivers, filtering, and statistical operations.
CO2: Demonstrate mathematical modeling and problem solving using such models.
CO3: Comparatively evolve key results developed in this course for applications to signal to process communications systems.
CO4: Develop frameworks based on probabilistic and stochastic themes for modeling and analysis of various systems involving functionalities in decision making, statistical inference, estimation, and detection.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓		✓							✓
CO2	✓			✓								✓
CO3	✓	✓	✓									✓
CO4	✓	✓	✓		✓							✓

Course Contents:

Unit 1: Review of random variables: Probability Concepts, distribution, and density functions, moments, independent, uncorrelated and orthogonal random variables; Vector-space representation of Random variables, Vector quantization, Tchebaychef inequality theorem, Central Limit Theorem, Discrete &Continuous Random Variables. Random process: Expectations, Moments,Ergodicity, Discrete-Time Random Processes Stationary process, autocorrelation and auto covariance functions, Spectral representation of random signals, Properties of power spectral density, Gaussian Process and White noise process.

Unit 2: Random signal modeling: MA(q), AR(p), ARMA(p,q) models, Hidden Markov Model & its applications, Linear System with random input, Forward and Backward Predictions, Levinson Durbin Algorithm.

Unit 3: Statistical Decision Theory: Bayes' Criterion, Binary Hypothesis Testing, M-ary Hypothesis Testing, Minimax Criterion, Neyman-Pearson Criterion, Composite Hypothesis Testing.
Parameter Estimation Theory: Maximum Likelihood Estimation, Generalized Likelihood Ratio Test, Some Criteria for Good Estimators, Bayes' Estimation Minimum Mean-Square Error Estimate, Minimum, Mean Absolute Value of Error Estimate Maximum A Posteriori Estimate, Multiple Parameter Estimation Best Linear Unbiased Estimator, Least-Square Estimation Recursive Least-Square Estimator.

Unit 4: Spectral analysis: Estimated autocorrelation function, Periodogram, Averaging the periodogram (Bartlett Method), Welch modification, Parametric method, AR(p) spectral estimation, and detection of Harmonic signals.

Unit 5: Information Theory and Source Coding: Introduction, Uncertainty, Information and Entropy, Source coding theorem, Huffman, Shanon Fano, Arithmetic, Adaptive coding, RLE, LZW Data compaction, LZ-77, LZ-78. Discrete Memory-less channels, Mutual information, channel capacity, channel coding theorem, Differential entropy, and mutual information for continuous ensembles.

References:

- Papoulis and S.U. Pillai, "Probability, Random Variables, and Stochastic Processes",4th Edition, McGraw-Hill, 2002.
- D.G. Manolakis, V.K. Ingle, and S.M. Kogon, "Statistical, and Adaptive Signal Processing", McGraw Hill, 2000.
- Mourad Barkat, "Signal Detection and Estimation", Artech House, 2nd Edition, 2005.
- R G. Gallager, "Information theory and reliable communication", Wiley, 1st edition, 1968.
- F. J. MacWilliams and N. J. A. Sloane, "The Theory of Error-Correcting Codes", New York, North-Holland, 1977.
- Rosen K.H, "Elementary Number Theory", Addison-Wesley, 6th edition, 2010.

TITLE OF COURSE: COGNITIVE RADIO
COURSE CODE: CED106
L-T-P: 3-0-0
CREDITS: 3

Course Outcomes (COs):
At the end of this course, students will be able to
CO1: Understand the fundamental concepts of cognitive radio networks.
CO2: Develop the cognitive radio and techniques for spectrum holes detection that cognitive radio takes advantage of to exploit it.
CO3: Understand technologies to allow efficient use of TVWS for radio communications based on two spectrum sharing business models/policies.
CO4: Understand fundamental issues regarding dynamic spectrum access, radio-resource management, and trading, as well as a number of optimization techniques for better spectrum exploitation.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓			✓	✓							✓
CO2		✓										
CO3			✓			✓		✓				✓
CO4						✓	✓		✓			

Course Contents:

Unit 1: Introduction to Cognitive Radios: Digital dividend, cognitive radio (CR) architecture, functions of cognitive radio, dynamic spectrum access (DSA), components of cognitive radio, spectrum sensing, spectrum analysis and decision, potential applications of cognitive radio.

Unit 2: Spectrum Sensing: Spectrum sensing, detection of spectrum holes (TVWS), collaborative sensing, geo-location database and spectrum sharing business models (spectrum of commons, real time secondary spectrum market).

Unit 3: Optimization Techniques of Dynamic Spectrum Allocation: Linear programming, convex programming, non-linear programming, integer programming, dynamic programming, stochastic programming.

Unit 4: Dynamic Spectrum Access and Management: Spectrum broker, cognitive radio architectures, centralized dynamic spectrum access, distributed dynamic spectrum access, learning algorithms and protocols.

Unit 5: Spectrum Trading: Introduction to spectrum trading, classification to spectrum trading, radio resource pricing, brief discussion on economics theories in DSA (utility, auction theory), classification of auctions (single auctions, double auctions, concurrent, sequential).

Unit 6: Research Challenges in Cognitive Radio: Network layer and transport layer issues, cross-layer

design for cognitive radio networks.

References:

- Ekram Hossain, Dusit Niyato, Zhu Han, “Dynamic Spectrum Access and Management in Cognitive Radio Networks”, Cambridge University Press, 2009.
- Kwang-Cheng Chen, Ramjee Prasad, “Cognitive radio networks”, John Wiley & Sons Ltd., 2009.
- Bruce Fette, “Cognitive radio technology”, Elsevier, 2nd edition, 2009.
- Huseyin Arslan, “Cognitive Radio, Software Defined Radio, and Adaptive Wireless Systems”, Springer, 2007.
- Francisco Rodrigo Porto Cavalcanti, Soren Andersson, “Optimizing Wireless Communication Systems” Springer, 2009.
- Linda Doyle, “Essentials of Cognitive Radio”, Cambridge University Press, 2009.

TITLE OF COURSE: RF AND MICROWAVE CIRCUIT DESIGN
COURSE CODE: CED107
L-T-P: 3-0-0
CREDITS: 3

Course Outcomes (COs):

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

CO1: Understand the behavior of RF passive components and model active components.

CO2: Perform transmission line analysis.

CO3: Demonstrate use of Smith Chart for high frequency circuit design.

CO4: Justify the choice/selection of components from the design aspects.

CO5: Contribute in the areas of RF circuit design.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓											
CO2				✓								
CO3				✓		✓	✓					
CO4		✓										✓
CO5					✓		✓	✓				

Course Contents:

Unit 1: Transmission Line Theory: Lumped element circuit model for transmission line, field analysis, Smith chart, quarter wave transformer, generator and load mismatch, impedance matching and tuning.

Unit 2: Microwave Network Analysis: Impedance and equivalent voltage and current, Impedance and admittance matrix, The scattering matrix, transmission matrix, Signal flow graph.

Unit 3: Microwave Components: Microwave resonators, Microwave filters, power dividers and directional couplers, Ferromagnetic devices and components.

Unit 4: Nonlinearity And Time VarianceInter-symbol interference, random process & noise, definition of sensitivity and dynamic range, conversion gain and distortion.

Unit 5: Microwave Semiconductor Devices And Modeling: PIN diode, Tunnel diodes, Varactor diode, Schottky diode, IMPATT and TRAPATT devices, transferred electron devices, Microwave BJTs, GaAs FETs, low noise and power GaAs FETs, MESFET, MOSFET, HEMT.

Unit 6: Amplifiers Design: Power gain equations, stability, impedance matching, constant gain and noise figure circles, small signal, low noise, high power and broadband amplifier, oscillators, Mixers design.

Reference:

- Matthew M. Radmanesh, "Advanced RF & Microwave Circuit Design: The Ultimate Guide to Superior Design", AuthorHouse, 2009.
- D.M.Pozar, " Microwave engineering" ,Wiley, 4th edition, 2011.
- R.Ludwig and P.Bretchko, "R. F. Circuit Design", Pearson Education Inc, 2009.
- G.D. Vendelin, A.M. Pavoi, U. L. Rohde, "Microwave Circuit Design Using Linear And Non Linear Techniques", John Wiley 1990.
- S.Y. Liao, "Microwave circuit Analysis and Amplifier Design", Prentice Hall 1987.
- Radmanesh, "RF and Microwave Electronics Illustrated" , Pearson Education, 2004.

TITLE OF COURSE: DSP ARCHITECTURE
COURSE CODE: CED108
L-T-P: 3-0-0
CREDITS: 3

Course Outcomes:
At the end of this course, students will be able to
CO1: Understand the value of education and self-development
CO2: Imbibe good values in students
CO3: Let they should know about the importance of character

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓		✓							✓
CO2	✓			✓								✓
CO3	✓	✓	✓									✓

Course Contents:

Unit 1: Programmable DSP Hardware: Processing Architectures (von Neumann, Harvard), DSP core algorithms (FIR, IIR, Convolution, Correlation, FFT), IEEE standard for Fixed and Floating Point Computations, Special Architectures Modules used in Digital Signal Processors (like MAC unit, Barrel shifters), On-Chip peripherals, DSP benchmarking.

Unit 2: Structural and Architectural Considerations: Parallelism in DSP processing, Texas Instruments TMS320 Digital Signal Processor Families, Fixed Point TI DSP Processors: TMS320C1X and TMS320C2X Family,TMS320C25 –Internal Architecture, Arithmetic, and Logic Unit, Auxiliary Registers, Addressing Modes (Immediate, Direct and Indirect, Bit-reverse Addressing), Basics of TMS320C54x and C55x Families in respect of Architecture improvements and new applications fields, TMS320C5416 DSP Architecture, Memory Map, Interrupt System, Peripheral Devices, Illustrative Examples for assembly coding.

Unit 3: VLIW Architecture: Current DSP Architectures, GPUs as an alternative to DSP Processors, TMS320C6X Family, Addressing Modes, Replacement of MAC unit by ILP, Detailed study of ISA, Assembly Language Programming, Code Composer Studio, Mixed Cand Assembly Language programming, On-chip peripherals, Simple applications developments as an embedded environment.

Unit 4: Multi-core DSPs: Introduction to Multi-core computing and applicability for DSP hardware, Concept of threads, introduction to P-thread, mutex and similar concepts, heterogeneous and homogenous multi-core systems, Shared Memory parallel programming –OpenMP approach of parallel programming, PRAGMA directives, OpenMP Constructs for work sharing like for loop, sections, TI TMS320C6678 (Eight Core subsystem).

Unit 5: FPGA based DSP Systems: Limitations of P-DSPs, Requirements of Signal processing for Cognitive Radio (SDR), FPGA based signal processing design-case study of a complete design of DSP processor.

Unit 6: High Performance Computing using P-DSP: Preliminaries of HPC, MPI, OpenMP, multicore DSP as HPC infrastructure.

References:

• M. Sasikumar, D. Shikhare, Ravi Prakash, "Introduction to Parallel Processing", 1st Edition, PHI, 2006.

• Fayez Gebali, "Algorithms and Parallel Computing",1st Edition, John Wiley & Sons, 2011

• Rohit Chandra, Ramesh Menon, Leo Dagum, David Kohr, DrorMaydan, Jeff McDonald,"Parallel Programming in OpenMP", 1st Edition, Morgan Kaufman,2000.

• Ann Melnichuk,Long Talk, "Multicore Embedded systems", 1st Edition, CRC Press,2010.

• Wayne Wolf, "High Performance Embedded Computing: Architectures, Applications and Methodologies", 1st Edition, Morgan Kaufman, 2006.

• E.S.Gopi, "Algorithmic Collections for Digital Signal Processing Applications Using MATLAB", 1st Edition, Springer Netherlands,2007.

TITLE OF COURSE: ADVANCED COMMUNICATION NETWORKS LABORATORY
COURSE CODE: CEC191
L-T-P: 0-0-4
CREDITS: 2

Course Outcomes (CO):
At the end of this course, students will be able to
CO1: Identify the different types of network devices and their functions within a network.
CO2: Understand and build the skills of sub-netting and routing mechanisms.
CO3: Understand basic protocols of computer networks, and how they can be used to assist in network design and implementation.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓				✓		✓	✓				✓
CO2	✓			✓								✓
CO3	✓						✓	✓				✓

Hands-on experiments based on syllabus CEC101

TITLE OF COURSE: WIRELESS AND MOBILE COMMUNICATION LABORATORY
COURSE CODE: CEC192
L-T-P: 0-0-4
CREDITS: 2

Course Outcomes (CO):
Upon successful completion of this course, students should be able to:
CO1: Understanding Cellular concepts, GSM and CDMA networks
CO2: To study GSM handset by experimentation and fault insertion techniques
CO3: Understating of 3G communication system by means of various AT commands usage in GSM
CO4: Understanding CDMA concept using DSSS kit
CO5: To learn, understand and develop concepts of Software Radio in real time environment.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓											
CO2				✓								
CO3				✓		✓	✓					
CO4		✓										✓
CO5					✓		✓	✓				

Hands-on experiments based on syllabus CEC102

TITLE OF COURSE: RESEARCH METHODOLOGY AND IPR
COURSE CODE:
L-T-P: 2-0-0
CREDITS: 2

Course Outcomes (COs):

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

CO 1: Understand research problem formulation.
CO 2: Analyze research-related information
CO 3: Follow research ethics
CO 4: Understand that Computer, Information Technology control today's world, but tomorrow world will be ruled by ideas, concept, and creativity.
CO5: Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
CO 6: Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓		✓							✓
CO2	✓			✓								✓
CO3	✓	✓	✓									✓
CO4	✓	✓	✓		✓							✓
CO5	✓			✓								✓
CO6	✓	✓	✓									✓

Course Contents:

Unit 1: Meaning of the research problem, Sources of the research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of the research problem. Approaches of investigation of solutions for the research problem, data collection, analysis, interpretation, Necessary instrumentations

Unit 2: Effective literature studies approach, analysis Plagiarism, Research ethics,

Unit 3: Effective technical writing, how to write a report, Paper Developing a Research Proposal, Format of the research proposal, a presentation and assessment by a review committee.

Unit 4: Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Unit 5: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

Unit 6: New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

References:

- Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'".
- Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
- Ranjit Kumar, 2 nd Edition , "Research Methodology: A Step by Step Guide for beginners"
- Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
- Mayall , "Industrial Design", McGraw Hill, 1992.
- Niebel , "Product Design", McGraw Hill, 1974.
- Asimov , "Introduction to Design", Prentice Hall, 1962.
- Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.

TITLE OF COURSE: DISASTER MANAGEMENT
COURSE CODE: A101
L-T-P: 2-0-0
Credits: 0

Course Outcomes (CO):
CO1: Develop an understanding of the key concepts, definitions a key perspectives of All Hazards Emergency Management
CO2: Understand the Emergency/Disaster Management Cycle REVISED
CO3: Have a basic understanding for the history of Emergency management
CO4: Develop a basic under understanding of Prevention, Mitigation, Preparedness, Response and Recovery.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓										✓
CO2	✓	✓		✓								✓
CO3	✓										✓	✓
CO4	✓	✓								✓	✓	✓

Course Contents:

Module-I: Introduction
Disaster: Definition, Factors and Significance; Difference between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.
Module-II: Repercussions Of Disasters And Hazards: Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.
Module-III: Disaster Prone Areas in India: Study Of Seismic Zones; Areas Prone To Floods and Droughts, Landslides and Avalanches; Areas Prone To Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics
Module-IV: Disaster Preparedness And Management: Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.
Module-V: Risk Assessment: Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co- Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.
Module-VI: Disaster Mitigation: Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs Of Disaster Mitigation in India.

Text Books:
1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies 'New Royal book Company.
2. Sahni, PardeepEt.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.

References:

1. Goel S. L., Disaster Administration And Management Text And Case Studies", Deep & Deep Publication Pvt. Ltd., New Delhi.

TITLE OF COURSE: ENGLISH FOR RESEARCH PAPER WRITING
COURSE CODE: A101
L-T-P: 2-0-0
CREDITS: 2

Course Outcomes (CO):
At the end of this course, students will be able to
CO1: Understand that how to improve your writing skills and level of readability
CO2: Learn about what to write in each section
CO3: Understand the skills needed when writing a title to ensure the good quality of paper at very first-time submission.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓		✓							✓
CO2	✓			✓	✓							✓
CO3	✓	✓	✓		✓							✓

Course Contents:

Unit 1: Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

Unit 2: Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction.

Unit 3: Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

Unit 4: Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

Unit 5: Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions.

Unit 6: useful phrases, how to ensure the paper is as good as it could be the first-time submission.

Reference Books:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

TITLE OF COURSE: SANSKRIT FOR TECHNICAL KNOWLEDGE
COURSE CODE: A101
L-T-P: 2-0-0
CREDITS: 0

Course Outcomes (CO):
At the end of this course, students will be able to
CO1: To get a working knowledge in illustrious Sanskrit, the scientific language in the world
CO2: Learning of Sanskrit to improve brain functioning
CO3: Learning Sanskrit to develop logic in mathematics, science & other subjects enhancing the memory power
CO4: The engineering scholars equipped with Sanskrit will explore the huge knowledge from ancient literature.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓		✓			✓				✓
CO2	✓			✓								✓
CO3	✓	✓	✓									✓
CO4	✓	✓	✓		✓						✓	✓

Course Contents:

Unit 1: Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences.

Unit 2: Order, Introduction of roots, Technical information about Sanskrit Literature

Unit 3: Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

Reference Books:

1. "Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

TITLE OF COURSE: VALUE EDUCATION
COURSE CODE: A101
L-T-P: 2-0-0
CREDITS: 0

Course Outcomes (CO):
At the end of this course, students will be able to
CO1: Identify and formalize architectural level characterization of P-DSP hardware
CO2: Ability to design, programming (assembly and C), and testing code using Code Composer Studio environment
CO3: Deployment of DSP hardware for Control, Audio and Video Signal processing applications
CO4: Understanding of major areas and challenges in DSP based embedded systems

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓		✓			✓				✓
CO2	✓			✓								✓
CO3	✓	✓	✓									✓
CO4	✓	✓	✓		✓						✓	✓

Course Contents:

Unit 1: Values and self-development – Social values and individual attitudes. Work ethics, Indian vision of humanism, Moral and non-moral valuation. Standards and principles, Value judgements.

Unit 2: Importance of cultivation of values, Sense of duty. Devotion, Self-reliance. Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity. Power of faith, National Unity, Patriotism.Love for nature, Discipline.

Unit 3: Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline, Punctuality, Love and Kindness, Avoid fault Thinking, Free from anger, Dignity of labour, Universal brotherhood and religious tolerance, True friendship, Happiness Vs suffering, love for truth, Aware of self-destructive habits, Association and Cooperation, Doing best for saving nature

Unit 4: Character and Competence –Holy books vs Blind faith, Self-management and Good health, Science of reincarnation, Equality, Nonviolence, Humility, Role of Women, All religions and same message, Mind your Mind, Self-control, Honesty, Studying effectively.

Reference Books:
Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi