

1.2.1 Percentage of new courses introduced of the total number of courses across all Programmes offered during the last five years

Name of the Department	Department of ECE
Programme Name	B.Tech. (ECE)
Course Code & Name	EC1592, EC1658, EC1659, EC1660, EC1661, EC1662, EC1663, EC1694, EC1695, EC1696
Year of Introduction	2016-17
Recommendation by Stakeholder	Faculty
Reason for New Courses introduced	New courses were introduced to give our students an exposure to different fields. Image processing as an open elective courses were added for students of other programmes who need some exposure in courses related to electronics and Communication.
Percentage of New Courses introduced in Year	(Total no of New Courses / Total no of courses offered) * $100 \Rightarrow \frac{10}{43} \times 100 = 23.25\%$
Percentage of Change	<25 % courses introduced – Yes / No YES >25 % courses introduced – Yes / No NO
Minutes of Board of Studies	Date :- 6-12-2016 (9BoS) Page No:- 5 Section No:- NA Point No:- 2 and 3 (scheme for III and IV year and syllabi for III year) Date :- 25-3-2017 (10BoS) Page No:- 7 Section No:- NA Point No:- 2 (approval of OE)
Minutes of Academic Council	Date :- 17-12- 2016 (17AC) Page No:- 2 and 3 Section No:- D Point No:- 2-1 (approval of III year Scheme) 2-4 (approval of III year syllabi except OE) Date :- 14-4-2017 (18AC) Page No:- 4 Section No:- D Point No:- 2-3 (for OE in V and VI semester)



17AC (D-1-7) Maximum Number of Attempts for Pre-Synopsis Presentation:

The Council directed that if DRC is not satisfied by the quality of Pre synopsis, the scholar needs to present / attempt it again incorporating all suggestions / comments till it gets approved.

17AC (D-1-8) Tenure of Faculty Boards:

The Council approved the duration of tenure of members of the Faculty Boards for a period of 03 (Three) years like statutory bodies and recommended that the matter be placed before the Board of Management for consideration and approval.

17AC (D-1-9) Renaming of Schools of Faculty of Design:

The Council deferred the proposal.

17AC (D-1-10) Offering of B Des Interior Design (4 year):

The Council deferred the proposal.

17AC (D-1-11) Verification and Non-retention of Students' Academic and Personal Testimonials and Remittance and Refund of Fees

The Council recommended to comply with UGC guidelines and seek legal opinion in this matter for further action. The Council also recommended to increase the caution money for professional programmes to Rs. 15,000 (Fifteen thousand) and Rs.10,000 (Ten thousand) for other programmes from next academic year.

The Council further suggested to take a separate undertaking from the student to return all equipment / book / laptop etc., at the time of withdrawal if it is done before completion of the programme.

17AC (D-2) FACULTY OF ENGINEERING

17AC (D-2-1) Revamped Scheme of 5th and 6th Semester B Tech Programmes:

The Council approved the revamped schemes of B Tech (ECE, EEE, CSE, CCE, IT, Mechanical Engineering, Mechatronics Engineering, Automobile Engineering, Chemical Engineering) of 5th and 6th Semester students, admitted in academic year 2015-16 and onwards.





17AC (D-2-2) Syllabi of B Tech Electrical & Electronics Engineering Programme:

The Council approved the proposed syllabi of 5th and 6th Semester of B Tech Electrical & Electronics Engineering Programme students, admitted in academic year 2015-16.

17AC (D-2-3) Syllabi of B Tech Electrical Engineering Programme:

The Council approved the proposed syllabi of 3rd and 4th Semester of B Tech Electrical Engineering Programme students, admitted in academic year 2016-17 and onwards.

17AC (D-2-4) Syllabi of B Tech Electronics & Communication Engineering Programme:

The Council approved the proposed syllabi (except open elective) of 5th and 6th semesters of B Tech Electronics & Communication Engineering Programme students, admitted in academic year 2015-16 and onwards.

17AC (D-2-5) Syllabi of B Tech Automobile Engineering Programme:

The Council approved the proposed syllabi of 5th and 6th semesters of B Tech Automobile Engineering Programme students, admitted in academic year 2015-16 and onwards.

17AC (D-2-6) Syllabi of New Programme and Open Elective Courses:

The Council approved the proposed syllabi of Department of Mechatronics Engineering as under:

- a) New Programme elective - Manufacturing Process-I MC1654 [4 0 0 4], (III Year), applicable to students admitted from 2014-15.
- b) Open Elective-II - Engineering Aspects of Intellectual Property Rights MC1691 [3 0 0 3], (III Year) and Reliability Engineering MC1692 [3 0 0 3], (III Year) applicable to students admitted from 2014-15.
- c) Open Elective-I - Introduction to Mechatronics System MC1493 [3 0 0 3], (II Year) applicable to students admitted from 2015-16 & onwards.

17AC (D-2-7) Modification in Relative Weightage of B Tech & M Tech Programmes:

The Council decided to retain existing evaluation scheme as 60-40. It was decided that weightage for CWS+MTE will remain 60 whereas weightage for ETE will have 40.





18AC (D-2-2) Revamped Syllabi of 5th and 6th Semester B Tech Programmes:

The Council approved the proposed syllabi of 5th and 6th Semesters of the following B Tech Programmes

- CSE
- CCE
- IT
- Mechanical Engg.
- Mechatronics Engg.
- Chemical Engg.
- Civil Engg.

The approved syllabi will be applicable from Academic Year 2017-18 onwards.

18AC (D-2-3) Syllabi of Open Elective Courses Offered by the Department of ECE:

The Council approved the proposed syllabi of Open Elective courses offered by the Department of ECE in 5th and 6th Semesters.

The approved syllabi will be applicable from Academic Year 2017-18 onwards.

18AC (D-2-4) Revamped Scheme of M Tech Programme:

The Council approved the proposed scheme of M Tech (Civil Engineering) Programme and modifications in scheme of M Tech (EE) programme.

The approved schemes will be applicable for the students admitted in Academic Year 2017-18 onwards.

18AC (D-2-5) Syllabi of M.Tech. Programme:

The Council approved the proposed syllabi of the following M Tech Programmes.

- Civil Engg
- Mechanical Engg.
- ECE
- EE

The approved syllabi will be applicable from Academic Year 2017-18 onwards.

18AC (D-2-6) Modifications in Existing Collaborative C-DAC M Tech Programme:

The Council approved renaming of specialization of M Tech CSE (with C-DAC) programmes as under:

- **Advanced Computing & Data Science** in place of **High Performance Computing**



SCHOOL OF ENGINEERING, MANIPAL UNIVERSITY JAIPUR
SCHOOL OF ELECTRICAL, ELECTRONICS & COMMUNICATION
ENGINEERING

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

MINUTES OF THE BOARD OF STUDIES (BOS) IX MEETING

Date	06/12/2016	Day	Tuesday	Time	10:00 AM	Venue	Board Room, 1A Building, 2 nd Floor
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Members Present

- Prof. S. N. Sharan (Director, SEEC)
- Dr. Amit Rathi (HOD, ECE)
- Prof. Vineet Sahula (External Expert)
- Prof. B.P. Singh
- Prof. Vivekanand Tiwari
- Prof. Manish Tiwari
- Dr. Tarun Kumar Dubey
- Dr. Renu Kumawat
- Prof. Amit Soni (Nominated member from other department)

Agenda Points

1. Welcome of the BOS Members by the Chairman BOS.
2. Approval of revised scheme for B.Tech (E&CE) III and IV year,
3. Approval of syllabus for 5th and 6th semester courses as per new B.Tech (E&CE) scheme
4. Finalizing scheme of M.Tech (E&CE)
5. Vote of thanks

MINTUES OF THE MEETING

No	Agenda Point	Discussion / Action
1	Welcome	<ul style="list-style-type: none"> • Chairman BOS welcomed all Board members
2	Approval of revised B.Tech. (E&CE) scheme of V, VI and VII semester	<ul style="list-style-type: none"> • Complete scheme of B.Tech (E&CE) was presented before the committee. • It was proposed and then decided that certain theory courses need to be reshuffled as per the sheet attached. • It was proposed to introduce a one-credit course Minor project in the sixth semester. Total credits will remain as 176 as the credits for HS1101 Value, Ethics & governance (4th semester) have been reduced to 2 credits from 3 credits in Academic council meeting held in July 2016. • It was proposed that Dynamic allocation of Program Electives may be carried out, the program Elective list may be prepared semester wise, and the student may choose any two electives from that list.
3	Approval of syllabus for B.Tech. (E&CE) 5 th and 6 th semester courses as per new	<ul style="list-style-type: none"> • Detailed syllabi of 5th and 6th semester as per new scheme was presented before the committee. • Board members explained the justification of inclusion and deletion of the content in the syllabus. • Prof. Sahula suggested as Electromagnetics is a three credit course, some of its

scheme

content may be deleted. As per his suggestion, the transmission line unit that was earlier added from Microwave Engineering may be deleted from it, only an Introduction to Transmission lines & waveguides may be kept as a part of the EC1507 Electromagnetic field & waves course.

- It was decided that sixth semester program elective courses “Digital Speech Processing” and “Digital Image Processing” be swapped with “Network Protocols and Security” and “Digital System Design using FPGAs” program electives of seventh semester.

- The board approved the introduction of following new program elective courses & their syllabus for students admitted in B.Tech (E&CE) in 2015-16 and onwards

New Program Elective Courses

EC1658	Data Structures and algorithms using C++	EC1661	VLSI Testing & verification
EC1659	Network Protocols & Security	EC1662	Digital System Design using FPGAs
EC1660	ARM System development	EC1663	Data Communication and Networks

- After a series of discussions, the board approved the revision in syllabi of the following courses applicable to students admitted in B.Tech (E&CE) in 2015-16 and onwards

Revamped Courses

EC1506	Embedded and Real Time Operating Systems	EC1607	Digital Signal Processing
EC1507	Electromagnetic Field and Waves	EC1656	VLSI/ULSI Process Technology
EC1508	Analog & Digital Communication	EC1657	Mobile Communication

- It was proposed that Open Electives and their course content needs to be designed with careful thinking, and presented before the board in next BoS meeting.
- The suggestions were incorporated and the syllabus of Core as well as Program Electives of 5th and 6th semester was approved by BoS.

4

Finalizing M.Tech (E&CE) scheme

- It was decided to float all core courses in First Semester and all program electives in second semester.
- The Laboratories may be named as EC2131 Modelling & Simulation Lab (common to both specializations), EC2231 System Design Lab/ Communication Systems Lab (depending on the specialization).
- Prof. Sahula suggested that EC2280 be converted to Minor Project instead of Seminar.
- Prof. Sahula suggested that EC2380 be Dissertation part-I & EC2480 be Dissertation part-II with weightage of 10 and 15 credits respectively & evaluation be closed in the same semester.
- The suggestions were incorporated and M.Tech (E&CE) scheme was finalized.

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Vote of thanks

- Chairman BoS delivered vote of thanks to the BoS members.

Signature of HOD with Date: 6/11/16



SCHOOL OF ENGINEERING, MANIPAL UNIVERSITY JAIPUR
SCHOOL OF ELECTRICAL, ELECTRONICS & COMMUNICATION
ENGINEERING

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

MINUTES OF THE BOARD OF STUDIES (BOS) X MEETING

Date : 25/03/2017 Day : Saturday Time : 04:00 PM Venue : Board Room, 1A Building, 2nd Floor

Members Present
 Prof. S. Sancheti (President, Manipal University Jaipur)
 Prof. Vineet Sahula (External Expert)
 Prof. Awdhesh Kumar
 Prof. S. N. Sharan (Director, SEEC)
 Dr. Amit Rathi (HOD, ECE)
 Prof. B.P. Singh
 Prof. Vivekanand Tiwari
 Prof. Manish Tiwari
 Dr. Tarun Kumar Dubey
 Dr. Renu Kumawat

Agenda Points

1. Approval of B.Tech (ECE) open electives syllabus (V & VI Semester).
2. Approval of syllabus for M.Tech as per new M.Tech (E&CE) scheme.
3. Approval of syllabus of PhD self-study courses "Spectrum Management in Wireless Communication Systems" & "Neuro Fuzzy Control Systems".

MINUTES OF THE MEETING

No	Agenda Point	Discussion / Action												
1	Welcome	<ul style="list-style-type: none"> Chairman BOS (HOD, ECE) welcomed all Board members. 												
2	Approval of syllabus of B.Tech. (ECE) V & VI semester open electives	<ul style="list-style-type: none"> Complete scheme of B.Tech (ECE) & syllabus of B.Tech (ECE) -V & VI Sem open electives were presented before the committee. It was decided that the open electives must be carefully designed so that there should be no prerequisite for any course being run as an open elective. It was decided that the contents of each course being designed must be agreed upon by three faculty from the department. Board members explained the justification of inclusion and deletion of the content of the syllabus. Board approved the syllabus of B.Tech open electives with minor corrections in the syllabus of EC1590, EC1591, EC1695, EC1696. The corrections have been incorporated and approved syllabus of B.Tech open electives is attached (Annexure- A) The board approved the introduction of following new open elective courses & their syllabus for students admitted in B.Tech (E&CE) in 2015-16 and onwards <table border="1"> <thead> <tr> <th colspan="4">New Open Elective Courses</th> </tr> </thead> <tbody> <tr> <td>EC1592</td> <td>Digital Image Processing</td> <td>EC1695</td> <td>Audio and Video Systems</td> </tr> <tr> <td>EC1694</td> <td>Non-Conventional Energy Sources</td> <td>EC1696</td> <td>Optical Fiber Technology</td> </tr> </tbody> </table>	New Open Elective Courses				EC1592	Digital Image Processing	EC1695	Audio and Video Systems	EC1694	Non-Conventional Energy Sources	EC1696	Optical Fiber Technology
New Open Elective Courses														
EC1592	Digital Image Processing	EC1695	Audio and Video Systems											
EC1694	Non-Conventional Energy Sources	EC1696	Optical Fiber Technology											

Department of Electronics & Communication Engineering

New courses introduced in 2016-17

SIXTH SEMESTER

Data Structures and Algorithms using C++

EC1658

[3 0 0 3]

An overview of C++ programming language: basic terms and operations, Data structures: definition of basic terms (data types, abstract data types and data structure). Importance of data structures in computer programming, Types of data structure: linear and non-linear data structure; Array: declaration, classification, application of arrays, List: operations, list implementation (array list, linked list), singly, doubly linked list, sorted list, Stack: operation, static and dynamic stacks, application of stacks, Queues: operations of queues, storing queues in static or dynamic data structures, Trees: binary search trees, trees transversal (inorder, postorder, and preorder), Common operations on a tree, application of trees in computer programming, Hashing and hash table, garbage collection, storage management, Analysis of algorithm, synergy between data structures and algorithm, Factors to be considered in the choice of data structures and algorithms, Practical implementation of linear data structures in C++.

Text / Reference books:

1. Hubbard, J.R. (2000). *Data Structures and Algorithms, Schaum's Outlines*. McGraw-Hill, New York, USA, 407p.
2. Lewis, H.R., Denenberg, L., (1991). *Data Structures and their Algorithms*. Published by Addison-Wesley, UK. 509p.

Network Protocols and Security

EC1659

[3 0 0 3]

Computer Networks and Internet: Introduction to Internet; Protocol; Network Edge: End System, Clients, Servers; Connection-oriented and Connectionless Services; Network Core: Circuit Switching, Packet Switching; Packet switched networks: Datagram and virtual-circuit networks, types of delay; Protocol layers and service models. Application Layer: Principles of Network Applications; The Web and HTTP (HyperText Transfer Protocol): Overview, Non-persistent and Persistent connections, HTTP message format, User-Server Interaction: Cookies, HTTP content, Web caching, The conditional GET. FTP (File Transfer Protocol): Introduction; FTP Commands and replies . Electronics Mail in Internet: SMTP (Simple Mail Transfer Protocol), Comparison with HTTP, Mail Access Protocols: POP3, IMAP. Domain Name Service (DNS): Services provided, Working, DNS Caching, DNS records and messages. Transport Layer: Connectionless Transport: UDP (User Datagram Protocol): Segment Structure, Checksum; Connection-oriented Transport: TCP (Transmission Control Protocol): Connection, Segment Structure, RTT (Round Trip Time) estimation, and Connection management, Delay modeling. Network Layer: Intra- Autonomous System (Intra-AS) Routing in the Internet: RIP (Routing Information Protocol), OSPF (Open Shortest Path First). Network Security: Introduction, Cryptography: principles, Cryptography model, Brute-force attack, Authentication Protocols: *ap1.0*, *ap2.0*, *ap3.0*, *ap4.0* and *ap5.0*; Integrity: Digital Signatures, Message Digests, Hash Function Algorithm; Key Distribution and Certification; Access Control:

Firewall: Packet Filtering, Application Gateway. Vulnerability, Threats, Attacks and Countermeasures: Virus, Worms, Trojan Horses, Mapping, Packet Sniffing, Spoofing, Denial-of-Service and Distributed

Denial-of-Service Attacks, Hijacking; Hacking: types of Hackers. Network Management: Introduction, Infrastructure required, Structure of Management Framework.

Text/ Reference Books:

1. James F. Kurose and K. W. Ross, “*Computer Networking: A Top-Down Approach Featuring the Internet*”, Pearson Education Publication, Third Edition, 2005.
2. William Stallings, “*Cryptography and Network Security: Principles and Practice*”, Prentice Hall publication, Fourth Edition, 2011.

ARM System Development

EC1660

[3 0 0 3]

Introduction to microcontroller: Review of different types of microprocessors and microcontrollers, History of Micro controllers, Embedded versus External memory devices, Microcontroller survey, CISC and RISC Microcontrollers, Harvard and von Neumann Architecture. 16 bit microcontrollers: CPU, register file, memory, serial and I/O ports, watchdog timer. 32 bit ARM Processor Fundamentals: Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table, Core Extensions, Architecture Revisions, ARM Processor Families. ARM Embedded Systems: The RISC Design Philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software. Introduction to the ARM Instruction Set: Data Processing Instructions, Branch Instructions, Load-Store Instructions, Software Interrupt Instruction, Program Status Register Instructions, Loading Constants, ARMv5E Extensions, Conditional Execution, Writing simple assembly language programs. Introduction to the Thumb Instruction Set: Thumb Register Usage, ARM-Thumb Interworking, Other Branch Instructions, Data Processing Instructions, Single-Register Load-Store Instructions, Multiple-Register Load-Store Instructions, Stack Instructions, Software Interrupt Instruction. ARM Organization and Implementation: 3-stage pipeline ARM organization, 5-stage pipeline ARM organization, ARM instruction execution, ARM implementation, The ARM coprocessor interface. Memory Hierarchy: Memory size and speed, On-chip memory, Caches, Cache design - an example, Memory management. Programming with ARM: Programming loops, Character coded data, Code conversion, and Arithmetic examples. Embedded ARM Applications: The VLSI Ruby II Advanced Communication Processor, The VLSI ISDN Subscriber Processor, The Ericsson-VLSI Bluetooth Baseband Controller.

Text Book:

1. S. Furber “*ARM System-on- Chip Architecture*”, Second Edition, Pearson Education, 2000.
2. J.R. Gibson “*ARM Assembly Language-an Introduction*” Dept. of Electrical Engineering and Electronics, The University of Liverpool, 2007.
3. A. N.Sloss, Dominic Symes, Chris Wright, “*ARM System Developer's Guide*” Elsevier, 2004.

Reference Books:

1. B.P. Singh & Renu Singh “*Advanced Microprocessors & Microcontrollers*”, New Age International, 2005.

VLSI Testing & Verification

EC1661

[3 0 0 3]

Physical Faults and their modeling: Stuck at Faults, Bridging Faults; Fault collapsing; Fault Simulation: Deductive, Parallel and Concurrent Fault Simulation. Critical Path Tracing. ATPG for Combinational

Circuits: D-Algorithm, Boolean Differences, PODEM Random, Deterministic and Weighted Random Test Pattern Generation; Aliasing and its effect on Fault Coverage. ATPG for Sequential Circuits: Time Frame Expansion; Controllability and Observability Scan Design, Boundary Scan for Board Level Testing; Memory Testing: Permanent, Intermittent and Pattern Sensitive Faults, Marching Tests; Delay Faults. PLA Testing: Cross Point Fault Model and Test Generation. Compression Techniques: General Aspects of Compression Techniques; Ones-Count, Transition Count and Parity Check Compression; Syndrome Testing; Signature Analysis; Built-In-Self-Test (BIST) Concept: Test-Pattern generation for BIST; Specific BIST Architecture – CSBL, LOCST, CBIST, RTD, BILBO; Introduction to Built-In-Self-Repair (BISR) Approaches. System Level Diagnosis & Repair: Introduction; Concept of Redundancy, Spatial Redundancy, Time Redundancy, Error Correction Codes. Verification: Design verification techniques based on simulation, analytical and formal approaches; Functional Verification, Timing Verification, Formal Verification, Basics of Equivalence Checking and model checking, Hardware Emulation.

Text / Reference books:

1. M. Abramovici, M. A. Breuer, & A.D. Friedman, "*Digital Systems Testing and Testable Design*", Piscataway, New Jersey: *IEEE Press*, 1994.
2. M. L. Bushnell and V. D. Agrawal, "*Essentials of testing for digital, memory and mixed-signal VLSI circuits*", Boston: *Kluwer Academic Publishers*, 2000.
3. Rashnikar, P., Paterson and Singh, L., "*System-On Chip Verification- Methodology and Techniques*"
Kluwer Academic Publishers, 2001.
4. Agarwal, V. D. and Seth, S. C. "Test generation for VLSI chips" IEEE computer society press.
5. P.K. Lala, "*Fault Tolerant & Fault Testable hardware Design*", *BS Publications*, 1998

Digital System Design using FPGAs

EC1662

[3 0 0 3]

Introduction: Digital System implementation using MSI/LSI circuits like PLDs, PLAs and PALs. Full-custom, semi-custom, standard cell based, Programmable ASICs – CPLDs, MPGAs and FPGAs, FPGA Design flow. Sequential Logic Design: Introduction, Basic Bi-stable Memory Devices, additional bi-stable devices, reduced characteristics and excitation table for bi-stable devices. Synchronous Sequential Logic Circuit

Design: Introduction, Moore, Mealy and Mixed type Synchronous State Machines. Synchronous sequential design of Moore, Melay Machines. Algorithmic State Machine: An Algorithm with inputs, digital solution, Implementation of traffic light controller, ASM charts, Design Procedure for ASMs. Digital System Design: Top down and Bottom up approach, Data Path, Control Path, Controller behavior and Design, Timing of sequential circuits, Pipelining, Resource sharing, FSM issues: State diagram optimization, State Assignment, Asynchronous Inputs, Output Races, Fault Tolerance. Data path and Control design using VHDL/Verilog HDL and it's mapping on FPGA.

Text/ Reference Books:

1. Zvi Kohavi, Switching and Finite Automata Theory, Tata McGraw-Hill.
2. Navabi. Analysis and modeling of digital systems. McGraw Hill, 1998.
3. Digital System Design, Ercegovac, Wiley.

4. Richard S. Sandige, Modern Digital Design, McGraw-Hill, 1990.
5. Perry. Modeling with VHDL. McGraw Hill, 1994.
6. Navabi. Verilog Digital Design. McGraw Hill, 2007.

Data Communication and Networks

EC1663

[3 0 0 3]

Introduction to the Data Communication and Networking: Types of Communication connections, Modes of Transmission, Need of communication networks, Classification of networks. Uses of communication networks. Layered Architecture: Overview, design issues, Network Software, Protocols & Standards, Network Hardware. Reference Models. ARPANET. Data Link Layer: Design Issues. Framing, Fixed-size framing, Variable-size framing (Character or Bit oriented: Character count, Flag bytes with byte stuffing, Starting and ending flags, with bit stuffing), Flow Control, Flow Control Protocols – Simplex, stop-and-wait, sliding window (stop-and-wait ARQ, Go-Back-N ARQ, Selective Repeat ARQ, Piggy backing in Go-Back-N ARQ). HDLC. Multiple Access Protocols (Random Access Protocols): Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA. Controlled Access Protocols: Reservation, Polling, Token Passing. Channelization Protocols: FDMA, TDMA, CDMA). Ethernet. Network Layer: Design Issues, Routing Algorithms: Desirable properties, Design Parameters. Types of routing: Static Routing, Flooding, Selective Flooding, Random Routing, Flow-based Routing, Dynamic Routing (Distance Vector Routing). Least Cost algorithms: Dijkstra’s Algorithm, Bellman-Ford Algorithm, Congestion Control mechanisms, Leaky Bucket Algorithm, Token Bucket Algorithm. Internet: Internetworking, IPv4 datagram, network layer in internet, internet control protocols, ICMP, IGMP, ARP, limitations of IPv4, Subnetting, Classful addressing, Classless addressing. Introduction to IPV6 Protocol IP addressing. Internet transport protocols: TCP and UDP frame structures.

Text/ Reference Books:

1. Behrouz A. Forouzan ,“Data Communications and Networking”, 4th Edition, Tata McGraw-Hill. 2007.
2. Andrew S. Tanenbaum , Computer Networks, 4th Edition. Prentice Hall of India, 2003.
3. William Stallings, Data & Computer communication, 8th Edition. Pearson, 2007.

Fundamentals of Image Processing

EC1592

[3 0 0 3]

Introduction to digital image processing: Digital Image Representation, Types of Images, Applications of image processing. Digital Imaging Systems: Types and basic requirements of Digital Imaging System, Physical aspects of image acquisition, Biological aspects of Image acquisition, Image sensors, digital camera. Digital Image Processing operations: Sampling and quantization, Image quality, Image storage and file formats, Basic relationship and distance metrics, Arithmetic operations, Logical operations, geometrical operations, Image interpolation techniques. Image enhancement and restoration: Image quality and need for enhancement; Image enhancement point operations: Linear and Non-linear functions, piecewise linear functions and histogram based techniques; Spatial filtering concepts for image enhancement; Image restoration: Image restoration in the presence of noise only using mean and order-statistics filters. Image compression: Image compression methods, Types of redundancy, Basic image

compression algorithms. Image segmentation and morphological processing: Detection of discontinuities; derivative type edge detection operators. Need for morphological processing; Binary image morphology operators. Color Image Processing: color image storage and processing; Color models.

Reference Books:

1. R.C. Gonzalez, R.E. Woods, "Digital Image Processing", 3rd Edition, Pearson, 2008.
2. S. Jayaraman, S. Esakkirajan and T. Veerakumar, "Digital Image Processing", TMH, 2010.
3. S. Sridhar, "Digital Image Processing", Oxford University Press, 2013.
4. A.K. Jain, "Fundamentals of Digital Image Processing", PHI, New Delhi, 2002.

Non-Conventional Energy Sources

EC1694

[3 0 0 3]

Scenario of Renewable Energy (RE) Sources: Needs of renewable energy, advantages and limitations of RE, present energy scenario of conventional and RE sources. Solar Energy: Energy available from the sun, spectral distribution, solar radiation outside the earth's atmosphere and at the earth's surface, solar radiation geometry, Instruments for solar radiation measurements, types of solar collectors, solar energy thermal storage, heating and cooling of buildings, solar cell modules and arrays, solar cell types, material, applications, advantages and disadvantages. Wind Energy: Energy available from wind, basics of wind energy conversion system, windmill rotors, horizontal and vertical axes rotors, drag, lift, torque and power coefficients, tip speed ratio, wind turbine performance curves, wind energy potential and site selection, basics of wind farm. Bio Energy: Types of biogas plants, biogas generation, factors affecting biogas generation, advantages and disadvantages, biomass energy, energy plantation, gasification, types and applications of gasifiers. Ocean Energy: OTEC principle, open, closed and hybrid cycle OTEC system, Energy from tides, estimation of tidal power, tidal power plants, single and double basin plants, site requirements, advantages and limitations. Geothermal energy: Introduction, vapour and liquid dominated systems, binary cycle, hot dry rock resources, magma resources, advantages and disadvantages. Economic Analysis: Initial and annual cost, basic definitions, present worth calculations, repayment of loan in equal annual instalments, annual savings, cumulative saving and life cycle cost, economic analysis of add on solar system, payback period, clean development mechanism.

Reference Books:

1. S. P. Sukhatme & J. K. Nayak "Solar Energy: Principles of Thermal Collection and Storage" Tata McGraw-Hill Education, 3rd edition, 2008.
2. J. A. Duffie and W.A. Beckman "Solar Engineering of Thermal Processes" 4th edition John Wiley, 2013.
3. S. N. Singh "Non-conventional energy resources", Pearson India, 2016.
4. F. Krieth, J. F. Kreider & D.Y. Goswami "Principles of Solar Energy" 3rd edition John Wiley, 1987.

Audio and Video System

EC1695

[3 0 0 3]

Basic Components of Audio and Video: Construction & Working of Microphone, types of microphone, Construction & Working of Loud Speaker, Tweeter, Woofer, Mid range, CCD Camera. HI-FI and

Stereophony : Meaning of Hi-Fi, Basic components, Fundamental of sound harmonics, Loudness, Pitch, Timbre, Sensitivity, Stereophony recording, Broadcasting of stereophony and its reproduction, Graphic equalizer, Basic idea about audio pre amplifier and power amplifiers. Scanning and Composite Video Signal : Scanning Process, Flicker & Inter lace scanning, Contrast Ratio & Aspect ratio and viewing distance, Composite Video signal dimensions, Horizontal and vertical sync details, TV standards for 625 line system. Basics of T.V. Signal Transmission & Reception: Block diagram of TV transmitter and TV Receiver. Colour T.V.: Introduction to Colour T.V. & colour T.V. Essentials. Basic Concept of New Trends : Audio CD player, Audio conferencing, Digital versatile disk (DVD), Home theatre system, LCD & LED TV, Plasma TV, Blue ray disc.

Reference Books:

1. A.K. Sawhney, "A Course in Electrical & Electronic Measurement & Instruments", 2015.
2. B. Grob, C. E. Herndon, "Basic Television & Video System", McGraw-Hill, 1999.
3. R. G. Gupta "Audio and Video Systems- Principles, Maintenance and Troubleshooting" McGraw Hill Education Limited, 2010.
4. R.R. Gulati, "Monochrome & Colour TV System" New age International, 3rd edition, 2009.
5. R. R. Gulati, "Modern Television –Practice, Principles, Technology & Servicing", New age International, 3rd edition, 2007.
6. A.M. Dhake, "T.V. and Video Engineering", McGraw Hill Education Ltd, 2nd edition, 2000.

Optical Fiber Technology

EC1696

[3 0 0 3]

Introduction: History of fiber optic communication, elements of an optical fiber communication system. Optical fiber, the nature of light, basic optical laws and definitions, fiber types, step index and graded index fiber, overview of modes, key modal concepts, single mode fiber, mode field diameter, fiber materials, fiber fabrication, and fiber optic cables. Signal degradation in optical fiber: Fiber losses, distortion, design optimization principles. Optical sources and detectors: LED, structure of LED, LED materials, types of LEDs, LASER, principle of LASER, structure of LASER diode and radiation pattern, photodiode, structure and principle of operation. Fiber Coupling: Fiber- to – fiber joints, alignment, losses, fiber splicing, optical fiber connectors, types and losses in fiber connectors. Optical fiber transmission link: Point- to – point link, system consideration, link power budget, passive components, amplifiers and networks. Applications and Future Developments: Military applications, Computer applications, Local area networks, Public network application, Medical applications, fiber optic sensors.

Reference Books:

1. J. M. Senior, "Optical Fiber Communications", Prentice Hall of India, 3rd edition, 2009.
2. G. Keiser, "Optical Fiber Communications", McGraw Hill, 3rd edition, 2000.
3. J. C. Palais, "Fiber Optic Communications", Pearson, 5th edition, 2005.
4. R.W. Waynant & M.N. Ediger, "Electro-Optics Handbook", McGraw Hill, 2nd edition, 2000.
5. H. Kolimbris, "Fiber Optics Communications", Pearson Education, 2004.