Estd. 1962
NAAC 'A' Grade
MHRD-NIRF- 28th Rank

**SHIVAJI UNIVERISTY, KOLHAPUR-416 004. MAHARASHTRA**
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दुरध्वनी (ईपीएबीएक्स) २६०९००० (अभ्यास मंडळे विभाग– २६०९०९४)
फॅक्स : ००९१-०२३१-२६९१५३३ व २६९२३३३.e-mail:bos@unishivaji.ac.in

**SU/BOS/Sci. & Tech/** No 0 0358 **Date: 15/09/2021**

17 SEP 2021

**To,**

**The Principal/ Director,**
All affiliated Engineering Colleges/ Institute,
Shivaji University, Kolhapur.

**Subject :** Regarding revised Syllabus and equivalence of CBCS Final Year B.Tech. Part-IV Sem-VII-VIII Program under Faculty of Science and Technology.

**Sir/Madam,**

With reference to the subject mentioned above, I am directed to inform you that the University Authorities have accepted and granted approval to structure and Syllabus of CBCS Final Year B.Tech. Part-IV Sem-VII-VIII under the Faculty of Science & Technology.

**B. Tech. Programme (Branch)**

| | |
|---|---|
| **1.** | Civil Engineering & Technology |
| **2.** | Mechanical Engineering & Technology ….. |
| **3.** | Electrical Engineering & Technology |
| **4.** | Chemcial Engineering & Technology |
| **5.** | Electronics Engineering & Technology |
| **6.** | Electronics and Telecommunication Engineering & Technology |
| **7.** | Computer Science Engineering & Technology |
| **8.** | Information Technology Engineering & Technology |
| **9** | Producation |

This revised syllabus and equivalence shall be implemented with effect from the academic year 2021-2022 (i.e. from June 2021) onwards.A soft copy containing syllabus is attached herewith and it is available on university website www.unishivaji.ac.in.

The question papers on the pre-revised syllabi of above mentioned course will be set for the examinations to be held in October /November 2021 & March/April 2022. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

**Yours faithfully,**

**Dy. Registrar**

**Copy to:**

| | | | |
|---|---|---|---|
| 1 | The I/c Dean,<br>Faculty of Science & Technology | 7 | Computer Centre |
| 2 | The Chairman, Respective Board of Studies | 8 | Affiliation Section (T.1) |
| 3 | Director, Examination and Evaluation | 9 | Affiliation Section (T.2) |
| 4 | Eligibility Section | 10 | P.G.Admission Section |
| 5 | O.E. – 4 | 11 | P.G Seminar Section |

# SHIVAJI UNIVERSITY, KOLHAPUR


**********

## Accredited by NAAC 'A' Grade
## Syllabus for

### Final Year Bachelor of Technology

### (B. Tech)

# Electronics Engineering Program

**(w. e. f. Academic Year: 2021-22)**

# Semester VII

| Sr. No. | Code No. | Subject | Semester | Credits |
|---|---|---|---|---|
| 1 | PCC-EN701 | Information theory and coding Techniques | 7 | 4 |
| 2 | PCC-EN702 | Embedded Systems | 7 | 5 |
| 3 | PCC-EN703 | Computer Networks | 7 | 5 |
| 4 | PCC-EN704 | Image Processing | 7 | 5 |
| 5 | PCE-EN701 | Elective-I | 7 | 4 |
| 6 | PW-EN701 | Project Phase-I | 7 | 2 |
| **Total** | | | | **25** |

# Semester VIII

| Sr. No. | Code No. | Subject | Semester | Credits |
|---|---|---|---|---|
| 1 | PCC-EN801 | Microwave Engineering | 7 | 5 |
| 2 | PCC-EN802 | Wireless communication | 7 | 5 |
| 3 | PCC-EN803 | Power electronics and drives | 7 | 5 |
| 4 | PCE-EN801 | Elective-II | 7 | 4 |
| 6 | PW-EN801 | Project Phase-II | 7 | 6 |
| **Total** | | | | **25** |

| **Elective-I (PCE-EN 701)** | | **Elective-II (PCE-EN801)** |
|---|---|---|
| 1 | Speech Processing | High Performance communication Network |
| 2 | Radar and Navigation | Advanced Network security |
| 3 | Java Script | Big Data Analytics |
| 4 | Satellite Communication | Electrical Automobiles |

*****For Theory CIE 30 Marks,**

**Two tests of 30 marks at college should be conducted and best of two marks should be communicated to university.**

*****Guidelines to paper setter:**

In theory ESE examination of 70 marks following pointes should be considered,

1. First question of 10 marks should be allotted to Objective type questions.
2. In Remaining 60 marks, four questions of 15 marks should be considered.

## Final Year ELECTRONICSENGINEERING– CBCS PATTERN

| Sr. No | Course (Subject Title) | TEACHINGSETCEME | | | | | | | | | EXAMINATIONSETCEME | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | THEORY | | | TUTORIAL | | | PRACTICAL | | | THEORY | | | | | PRACTICAL | | | TERMWORK | | |
| | | Credits | No. of Lecture | Hours | Credits | No .of Lecture | Hours | Credits | No. of Lecture | Hours | Hours | Mode | Marks | Total Marks | Min | Hours | Max | Min | Hours | Max | Min |
| **SEMESTER–VII** | | | | | | | | | | | | | | | | | | | | | |
| 1 | PCC-EN701 | 3 | 3 | 3 | 1 | 1 | 1 | - | - | - | | CIE | 30 | 100 | 12 | As per BOS Guidelines | - | - | 2 | 25 | 10 |
| | | | | | | | | | | | | ESE | 70 | | 28 | | | | | | |
| 2 | PCC-EN702 | 4 | 4 | 4 | - | - | - | 1 | 2 | 2 | | CIE | 30 | 100 | 12 | | 50 | 20 | 2 | 25 | 10 |
| | | | | | | | | | | | | ESE | 70 | | 28 | | | | | | |
| 3 | PCC-EN703 | 4 | 4 | 4 | - | - | - | 1 | 2 | 2 | | CIE | 30 | 100 | 12 | | 50 | 20 | 2 | 25 | 10 |
| | | | | | | | | | | | | ESE | 70 | | 28 | | | | | | |
| 4 | PCC-EN704 | 4 | 4 | 4 | - | - | - | 1 | 2 | 2 | | CIE | 30 | 100 | 12 | | - | - | 2 | 25 | 10 |
| | | | | | | | | | | | | ESE | 70 | | 28 | | | | | | |
| 5 | PCE-EN701 | 3 | 3 | 3 | 1 | 1 | 1 | - | - | - | | CIE | 30 | 100 | 12 | | - | - | 2 | 25 | 10 |
| | | | | | | | | | | | | ESE | 70 | | 28 | | | | | | |
| 6 | PW-EN701 | - | - | - | - | - | - | 2 | 4 | 4 | | - | - | - | - | | 25 | 10 | 2 | 50 | 20 |
| | **TOTAL** | **18** | **18** | **18** | **2** | **2** | **2** | **5** | **10** | **10** | | | | **500** | | | **125** | | | **175** | |
| **SEMESTER–VIII** | | | | | | | | | | | | | | | | | | | | | |
| 1 | PCC-EN801 | 4 | 4 | 4 | - | - | - | 1 | 2 | 2 | | CIE | 30 | 100 | 12 | | 50 | 20 | 2 | 25 | 10 |
| | | | | | | | | | | | | ESE | 70 | | 28 | | | | | | |
| 2 | PCC-EN802 | 4 | 4 | 4 | - | - | - | 1 | 2 | 2 | | CIE | 30 | 100 | 12 | | - | - | 2 | 25 | 10 |
| | | | | | | | | | | | | ESE | 70 | | 28 | | | | | | |
| 3 | PCC-EN803 | 4 | 4 | 4 | - | - | - | 1 | 2 | 2 | | CIE | 30 | 100 | 12 | | 50 | 20 | 2 | 25 | 10 |
| | | | | | | | | | | | | ESE | 70 | | 28 | | | | | | |
| 4 | PCE-EN801 | 3 | 3 | 3 | 1 | 1 | 1 | - | - | - | | CIE | 30 | 100 | 12 | | - | - | 2 | 25 | 10 |
| | | | | | | | | | | | | ESE | 70 | | 28 | | | | | | |
| 5 | PW-EN801 | - | - | - | - | - | - | 6 | 8 | 8 | | - | - | - | - | | 150 | 60 | 2 | 50 | 20 |
| | | | | | | | | | | | | - | - | | | | | | | | |
| | **TOTAL** | **15** | **15** | **15** | **1** | **1** | **1** | **9** | **14** | **14** | | **TOTAL** | | **400** | | | **250** | | | **150** | |
| | | | | | | | | | | | | | | | | | | | | | |
| | **TOTAL** | **33** | **33** | **33** | **3** | **3** | **3** | **14** | **24** | **24** | | **900** | | | | | | **375** | | **325** | |

| | |
|---|---|
| • Candidate contact hours per week:30 Hours (Minimum) | • TotalMarksforB.E.SemVII&VIII: **1600** |
| • Theory and Practical Lectures : 60 Minutes | • TotalCreditsforB.E.SemVII&VIII: **50** |
| • In theory examination there will be a passing based on separate head of passing for examination of CIE and ESE. | |
| • There shall be separate passing for theory and practical (term work) courses. | |

# Note:

1. **PCC-EN:** Professional Core course – Electronics Engineering are compulsory.
2. **PCE-EN:** Professional Core Elective–Electronics Engineering is compulsory.
3. **PW-EN**: Project work-Electronics Engineering is compulsory.
4. **PW-EN**: Project work-Electronics Engineering is compulsory.
5. **MC-EN:** Mandatory Course-Electronics Engineering is compulsory

**SHIVAJI UNIVERSITY, KOLHAPUR**

**ELECTRONICS ENGINEERING**

**SUBJECT NAME: INFORMATION THEORY AND CODING TECHNIQUES**

**Course Details**

| | |
|---|---|
| **Class** | **Final Year B. Tech. Sem-VII** |
| **Course Code and Course Title** | **PCE-EN701:Information Theory And Coding Techniques** |
| **Prerequisites** | **Digital Communication, Probability, Mathematics** |
| **Teaching scheme: Lectures +Tutorial** | **3 Hrs. + 1 Hr.** |
| **Credits** | **3 + 1** |
| **Evaluation Scheme ESE + CIE for Theory** | **70 (ESE) + 30 (CIE)** |

| **Teaching scheme** | **Examination scheme** |
|---|---|
| **Lectures: 3 Hrs. /Week** | **Theory: 100 Marks, 70 (ESE) + 30 (CIE)** |
| **Tutorial: 1 Hr./Week** | **TW: 25 Marks** |

| **Course Objectives:** The course aims to : | |
|---|---|
| 1 | To understand information theory, estimate information content of a random variable from its probability distribution. |
| 2 | To understand the types of communication channels, their capacities and construct efficient codes for data on imperfect communication channels. |
| 3 | To understand the need & objective of error control coding with encoding & decoding procedure to analyze error detecting & correcting capability of different codes. |

| **Course Outcomes:** After the completion of the course the student should be able to: | |
|---|---|
| 1 | Explain basic concepts of information theory and entropy coding. |
| 2 | Mathematically analyze communication channel models & Channel capacity. |
| 3 | Analyze the error detecting and correcting capability of different coding schemes. |

| | |
|---|---|
| 4 | Design encoder and decoder for various coding techniques as per the need and Specifications. |

| COURSE CONTENT | | |
|---|---|---|
| **Unit No.1** | **INFORMATION THEORY**<br>Introduction, Concept of information: Unit, Properties, Entropy (Average Information) : Definition, Mathematical expression of Entropy, Entropy of Binary Source, Properties and Information Rate, Joint Entropy, Conditional entropy, relation between Joint & Conditional Entropies, Mutual Information: Average Mutual Information, Expression for Mutual information, Relation between Mutual Information & Entropy | **6 Hrs.** |
| **Unit No.2** | **CHANNAL CAPACITY AND CODING**<br>Channel Capacity, Redundancy and Efficiency of channel, Discrete memory less channel – Channel Matrix, Classification of channels: lossless Channel, Deterministic Channel, Noise free channel, Binary Symmetric Channel (BSC), Cascaded Channels and Binary Erasure Channel (BEC), Calculation of channel capacity of all channels, Shannon's fundamental theorem, Entropy Coding: Shannon Fano Coding, Huffman's Coding, Coding Efficiency Calculations. | **6 Hrs.** |
| **Unit No.3** | **LINEAR BLOCK CODES**<br>Introduction: Error Control Coding: Need, Objectives & Approaches of Error Control Coding Classification, Error Detection and Error Correction Techniques, Linear Block Code: Structure, Terms Related to Block Code, Matrix Description of Linear Block Code, Generator and Parity Check Matrices, Encoder and Syndrome decoder for (n, k) block Code. | **6 Hrs.** |
| **Unit No.4** | **CYCLIC CODES**<br>Algebraic structure, Properties, Polynomial representation of Codeword, Generator Polynomial, Generation of Code Vector in Nonsystematic and Systematic form, Generator and Parity check matrices in Systematic form, Encoding of Cyclic Code, Syndrome decoding for Cyclic code, Hardware Representation of (n, k) cyclic code. Cyclic Redundancy Check Code. | **6 Hrs.** |

| | | |
|---|---|---|
| **Unit No.5** | **BCH & RS CODE**<br>Binary Field Arithmetic, BCH Code: Properties, Primitive element and primitive polynomial, Primitive BCH Code, Construction of Galois Field GF ($2^m$ ), Addition & Multiplication of GF ($2^m$ ), Properties of Galois Field GF ( $2^m$ ), Minimal & Generator Polynomial for BCH Code, Decoding of BCH Code, Reed-Solomon code: Introduction, Error correction capability of RS code, RS code in Nonsystematic & Systematic form, Decoding of RS code. | **6 Hrs.** |
| **Unit No.6** | **CONVOLUTIONAL CODE**<br>Introduction, Encoding of Convolutional Codes, Generation of Output code sequence : Time Domain Approach, Transform Domain Approach, Generator Matrix, Graphical Approach – Code Tree, State diagram and Trellis Diagram, Decoding of Codes : Maximum Likelihood Decoding -Viterbi Algorithm, Sequential Decoding . | **6 Hrs.** |

**TEXT BOOKS:**

| | |
|---|---|
| 1 | R.P Singh & S.D.Sapre , "Communication Systems Analog & Digital", Mc-Graw Hill, IInd Edition, 2001. |
| 2 | Muralidhar Kulkarni, K.S. Shivprakasha , "Information Theory & Coding", Wiley (India) Publication 2014 |
| 3 | Arijit Saha,Surajit Mandal, "Information Theory, Coding & Cryptography", Pearson Education, Ist Edition, 2013. |

**REFERENCE BOOKS:**

| | |
|---|---|
| 1 | Simon Haykin, "Communication Systems ", John Wiley & Sons, Inc, IVth Edition |
| 2 | Ranjan Bose, "Information Theory Coding & Cryptography", Tata McGraw-Hill Publishing Company Ltd, IInd Edition 2008 |
| 3 | Salvatore Gravano, "Introduction to Error Control Codes", Oxford University Press, I st Edition, 2001 |

**TERM WORK: (Minimum 8 tutorials/ Assignments)**

**Minimum Eight (8) tutorials / assignments based on above syllabus covering all units.**

**GUIDELINES TO PAPER SETTER:**

**In theory ESE examination of 70 marks following points should be considered:**

**Question paper should contain 70% numerical and 30% theory.**

Q.1 MCQ's based on complete syllabus (14 Marks)

Q.2 Based on unit no 1, 2, 3 (14 marks)

Q.3 Based on unit no 1, 2, 3 (14 marks)

Q.4 Based on unit no 4, 5, 6 (14 marks)

Q.5 Based on unit no 4, 5, 6 (14 marks)

**SHIVAJI UNIVERSITY, KOLHAPUR**

**ELECTRONICS ENGINEERING**

**SUBJECT NAME: EMBEDDED SYSTEMS**

**Course Details**

| | |
|---|---|
| **Class** | **Final Year B. Tech. Semester - VII** |
| **Course Code and Course Title** | **PCC-EN 702: Embedded Systems** |
| **Prerequisites** | **Fundamentals of Microprocessor and Microcontroller and 'C' Programming** |
| **Teaching scheme: Lectures + Practical** | **4 Hrs. + 2 Hrs.** |
| **Credits** | **4 + 1** |
| **Evaluation Scheme ESE + CIE for Theory** | **70 (ESE) + 30 (CIE)** |

| **Teaching scheme** | **Examination scheme** |
|---|---|
| **Lectures : 4 Hrs. / Week** | **Theory : 100 Marks, 70 (ESE) + 30 (CIE)** |
| **Practical : 2 Hrs. / Week** | **TW: 25 Marks POE: 50 Marks** |

| **Course Objectives:** The course aims to : | |
|---|---|
| 1. | Study different concepts and programming of PIC 16F877 |
| 2. | Study different on-chip resources of PIC 16F877 |
| 3. | Study different concepts of ARM7 |
| 4. | Study Programming of ARM7 |
| 5. | Study different on chip resources of LPC 2148 |
| 6. | Understand basic concepts of RTOS |

| **Course Outcomes:** Upon successful completion of this course, the students will be able to: | |
|---|---|
| 1. | Develop programs using PIC 16F877 |
| 2. | Apply on-chip resource facility of PIC 16F877. |
| 3. | Understand Embedded systems and concepts of ARM7. |
| 4. | Develop programs using ARM7 |
| 5. | Apply on chip resource facility of LPC 2148. |
| 6. | Understand RTOS concept |

| COURSE CONTENTS | | |
|---|---|---|
| **Unit No.1** | **INTRODUCTION TO PIC MICROCONTROLLER**<br>Difference between RISC and CISC architecture, Features of PIC 16F877, Functional Pin out, CPU Architecture, Memory organization, Register file structure, CPU Registers: Status Word, FSR, INDF, PCLATH, PCL, Instruction set, Addressing modes and Simple assembly language Programming. | **8 Hrs.** |
| **Unit No.2** | **ON-CHIP RESOURCES OF PIC 16F877**<br>I/O Ports, Timers, CCP Module, ADC, I2C, SPI, Associate registers and programming, Interrupt structure, Configuration word, Oscillator configuration, Reset alternatives. | **8 Hrs.** |
| **Unit No.3** | **INTRODUCTION TO EMBEDDED SYSTEM AND ARM PROCESSOR**<br>**EMBEDDED SYSTEM:** Embedded System definition, Types of Embedded System, Characteristics and Design issues of Embedded systems.<br>**ARM:** Embedded system Hardware, ARM data flow model, Register set, CPSR, Pipelining, Exceptions Interrupts & Vector Table, Cache and Tightly coupled memory, ARM Nomenclature. | **8 Hrs.** |
| **Unit No.4** | **INSTRUCTION SET AND PROGRAMMING**<br>ARM Instruction set, Thumb Instruction set, Simple assembly language programming. | **7 Hrs.** |
| **Unit No.5** | **LPC 2148 MICROCONTROLLER**<br>Features, Architecture details, Port structure, Timer/Counter, UART**,** ADC module, Embedded 'C' programming for interfacing LED's, LCD, Keyboard. | **9 Hrs.** |
| **Unit No.6** | **REAL TIME OPERATING SYSTEM (RTOS)**<br>Introduction to RTOS concept, Embedded software architectures: Round robin, Round robin with interrupts, Function queue scheduling and Real time operating system, Tasks and Task states, Task scheduling, Shared data and Reentrancy, Semaphores and shared data using semaphores, Protecting shared data. | **8 Hrs.** |

**TEXT BOOKS:**

| | |
|---|---|
| **1.** | Design with PIC Microcontrollers by John B. Peatman, Pearson |
| **2.** | Embedded System Design By Frank Vahid / Tony Givargis, Wiley Publication |
| **3.** | An Embedded Software Primer, David E. Simon Pearson Education, Asia Publication |
| **4.** | ARM System Developers Guide Designing & Optimizing System Software by Andrew N., Dominic Sloss, and Chris Wright. |
| **5.** | Datasheet of PIC16F877 and LPC 2148 |

**REFERENCE BOOKS:**

| | |
|---|---|
| **1.** | Embedded systems by Raj Kamal, McGraw Hill |
| **2.** | Real- Time Systems Design and Analysis by Phillips A. Laplante, Wiley insia Edition. |
| **3.** | Embedded/ Real-Time Systems: Concepts, Design & Programming By Dr. K V K K Prasad, Dreamtech Press |
| **4.** | Embedded Systems (A contemporary design tool) by James K Peckol, Wiley Publication. |

**LIST OF EXPERIMENTS: (MINIMUM EIGHT (8) EXPERIMENTS)**

| Sr. No. | Title of Experiment |
|---|---|
| **1.** | To study Arithmetic and Logical instructions in PIC 16F877. |
| **2.** | To study Indirect Addressing mode in PIC 16F877. |
| **3.** | To Flash LED connected to Port using Timer delay in PIC 16F877 |
| **4.** | To study any application using CCP Module in PIC 16F877 |
| **5.** | To demonstrate serial communication in PIC 16F877 |
| **6.** | To study Arithmetic and Logical instructions in LPC 2148 |
| **7.** | To study Load and Store instructions in LPC 2148 |
| **8.** | To flash the Port pin of LPC 2148 using Embedded ‘C’. |
| **9.** | To demonstrate input/ output device interfacing related programs in LPC 2148 using Embedded ‘C’. |
| **10.** | To demonstrate serial communication in LPC 2148 using Embedded ‘C’. |

**GUIDELINES TO PAPER SETTER:**

**In theory ESE examination of 70 marks following points should be considered:**

**Question paper should contain 30% programming and 70% theory.**

Q.1 MCQ's based on complete syllabus. (14 Marks)

Q.2 Based on unit no 1, 2, 3 (Carries 14 marks)

Q.3 Based on unit no 1, 2, 3 (Carries 14 marks)

Q.4 Based on unit no 4, 5, 6 (Carries 14 marks)

Q.5 Based on unit no 4, 5, 6 (Carries 14 marks)

**SHIVAJI UNIVERSITY, KOLHAPUR**

**ELECTRONICS ENGINEERING**

**SUBJECT NAME: COMPUTER NETWORKS**

**Course Details**

| | |
|---|---|
| **Class** | **Final Year B. Tech. Sem-VII** |
| **Course Code and Course Title** | **PCC-EN703: Computer Networks** |
| **Prerequisites** | **Digital Communication** |
| **Teaching scheme: Lectures + Practical** | **4 Hrs. + 2 Hrs.** |
| **Credits** | **4 + 1** |
| **Evaluation Scheme ESE + CIE for Theory** | **70 (ESE) + 30 (CIE)** |

| **Teaching scheme** | **Examination scheme** |
|---|---|
| **Lectures: 4 Hrs. /Week** | **Theory: 100 Marks, 70 (ESE) + 30 (CIE)** |
| **Practical : 2 Hrs./Week** | **TW: 25 Marks, OE: 50 Marks** |

| **Course Objectives:** The course aims to : | |
|---|---|
| 1 | To provide students with an overview of the concepts and fundamentals of data communication and computer networks |
| 2 | Review the state of art in open research area such as LAN, MAN, WLAN & applications Computer Networking |
| 3 | Acquire the required skill to design simple computer networks. |
| 4 | Describe various functions and protocols at each layer of OSI and TCP/IP reference models. |

| **Course Outcomes:** Upon successful completion of this course, the students will be able to: | |
|---|---|
| 1 | State the evolution of Computer network, classifies different types of Computer Networks. |
| 2 | Design, implements, and analyzes simple computer networks. |

| | | |
|---|---|---|
| 3 | Identify, formulate, and solve network engineering problems. | |
| 4 | Illustrate different OSI and TCP/IP protocols. | |
| **COURSE CONTENTS** | | |
| **Unit No.1** | **INTRODUCTION TO COMPUTER NETWORK**<br>History and development of computer network, network application, network software and hardware components, reference models: layer details of OSI,TCP/IP models., Network topology, Transmission media and types, Network Devices: Network Connectors, Hubs, Switches, Routers, Bridges. | **6 Hrs.** |
| **Unit No.2** | **DATA LINK LAYER**<br>Design issues, sliding window protocols. HDLC – types of stations, modes of operation & frame formats, Random access Protocols, IEEE 802.3 frame formats. | **6 Hrs.** |
| **Unit No.3** | **NETWORK LAYER**<br>Design issues, Routing algorithms – shortest path, distance vector routing, link state routing. Routing protocols - RIP, OSPF, IP Addressing, Sub netting/super netting, IPv4, IPv6 header format and basic address mode, DHCP, Congestion control, traffic shaping algorithms. | **8 Hrs.** |
| **Unit No.4** | **TRANSPORT LAYER**<br>Transport layer-Process to process delivery, UDP, TCP, TCP services, TCP Segment, TCP Timers, Flow control, congestion control and Quality of Service. | **8 Hrs.** |
| **Unit No.5** | **APPLICATION LAYER**<br>DNS, HTTP, SMTP, Telnet, FTP | **8 Hrs.** |
| **Unit No.6** | **MULTIMEDIA IN INTERNET**<br>Streaming stored audio/video, Real-time interactive audio/video, Real-time transport protocol (RTP), Real-time transport control protocol (RTCP), Voice over IP (VoIP) | **6 Hrs.** |

**TEXT BOOKS:**

| | |
|---|---|
| 1 | Forouzan, , “Data Communication and Networking” IIndedition,TataMc-Graw Hill, Publication |
| 2 | Tanenbaum, “Computer Neworks”, IVth Edition, pearson Education |

**REFERENCE BOOKS:**


| | |
|---|---|
| 1 | Wayne Tomasi, "Introduction to Data communications and Networking" Pearson Education. |
| 2 | Forouzan, "TCP/IP Protocol Suite", IIIrd Edition Tata Mc-Graw Hill publication. |


**NOTE: Minimum Eight (8) Practical's based on above syllabus.**

**GUIDELINES TO PAPER SETTER:**

**In theory ESE examination of 70 marks following points should be considered:**

Q.1 MCQ's based on complete syllabus. (Carries14 Marks)

Q.2 based on unit no 1, 2, 3 (Carries 14 Marks)

Q.3 based on unit no 1, 2, 3 (Carries 14 Marks)

Q.4 based on unit no 4, 5, 6 (Carries 14 Marks)

Q.5 based on unit no 4, 5, 6 (Carries 14 Marks)

**SHIVAJI UNIVERSITY, KOLHAPUR**

**ELECTRONICS ENGINEERING**

**SUBJECT NAME: IMAGE PROCESSING**

**Course Details**

| | |
|---|---|
| **Class** | **Final Year B. Tech. Sem-VII** |
| **Course Code and Course Title** | **PCC-EN704: Image processing** |
| **Prerequisites** | **Digital Signal processing** |
| **Teaching scheme: Lectures + Practical** | **4 Hrs. + 2 Hrs.** |
| **Credits** | **4 + 1** |
| **Evaluation Scheme ESE + CIE for Theory** | **70 (ESE) + 30 (CIE)** |

| **Teaching scheme** | **Examination scheme** |
|---|---|
| **Lectures: 4 Hrs./ Week** | **Theory: 100 Marks,**<br>**70 (ESE) + 30 (CIE)** |
| **Practical: 2 Hrs. / Week** | **TW: 25 Marks** |

| **Course Objectives:**<br>The course aims : | |
|---|---|
| 1 | To study fundamentals of Digital Image Processing. |
| 2 | To acquaint students with mathematical transforms for image processing. |
| 3 | To familiarize students with image filtering techniques. |
| 4 | To understand different morphological operations. |
| 5 | To introduce various image segmentation techniques. |
| 6 | To explain different image compression techniques and color image processing. |
| **Course Outcomes:**<br>Upon successful completion of this course, the students will be able to: | |
| 1 | List fundamental steps involved in Digital Image Processing. |
| 2 | Apply different transforms and filtering techniques on an image. |
| 3 | Apply morphological operations |
| 4 | Perform image segmentation |
| 5 | Apply compression techniques. |
| 6 | Perform various operations on color image. |

| COURSE CONTENTS | | |
|---|---|---|
| **Unit No.1** | **DIGITAL IMAGE FUNDAMENTALS**<br>Fundamentals steps in DIP, Components of image processing system, Elements of Visual Perception, Image sensing and acquisition, image sampling and quantization, basic relations between pixels | **8 Hrs.** |
| **Unit No.2** | **IMAGE TRANSFORMS**<br>Basic intensity transformation: image negation, Log transformation, power law transformation, Piecewise linear transformation functions, arithmetic and Logic operation, Histogram processing (equalization and matching), sine cosine, Hadamard, Haar, Slant transform . | **8 Hrs.** |
| **Unit No.3** | **IMAGE FILTERING**<br>Fundamentals of spatial filtering, smoothening and Sharpening in spatial domain, smoothening and Sharpening in frequency domain. | **7 Hrs.** |
| **Unit No.4** | **MORPHOLOGICAL IMAGE PROCESSING**<br>Dilation & erosion, opening and closing operation, Hit- or – miss transformation. Basic morphological algorithms: Boundary extraction, region filling, thinning and thickening, skeletons | **8 Hrs.** |
| **Unit No.5** | **IMAGE SEGMENTATION**<br>Detection of discontinuities: Point detection, line detection, edge detection, (Sobel, Prewitt, Laplacian), global and adaptive thresholding, Region based segmentation (region growing, region splitting and merging). | **8 Hrs.** |
| **Unit No.6** | **IMAGE COMPRESSION**<br>Fundamentals, Coding redundancy, inter pixel redundancy, fidelity criteria, image compression model, lossless predictive coding, Lossy predictive coding<br>**COLOR IMAGE PROCESSING**<br>Color fundamentals, Color models, pseudo scalar, image processing, full color image processing, Color transformations | **9 Hrs.** |

**TEXT BOOKS:**


| | |
|---|---|
| 1 | Digital image processing: Rafael C Gonzalez , Richard E. Woods: Pearson Publication |
| 2 | Digital image processing and Analysis- B. Chanda , D. Datta , majnudar |
| 3 | Fundamentals of digital Image Processing- Anil K.Jain. |

**REFERENCE BOOKS:**


| | |
|---|---|
| 1 | Digital image processing and Analysis- B. Chanda , D. Datta, majnudar:PHI |
| 2 | Digital image processing using Matlab- Rafael C Gonzalez |
| 3 | Fundamentals of Digital Image Processing-S.Annadurai, R. Shanmugalaxmi : Pearson Publication |
| 4 | Digital Image Processing- S.Shridhar 6 Digital Image Processing – Pratt |


**Practical based on MATLAB/Scilab programs**: **Any Eight (8) experiments based on above syllabus**

| | |
|---|---|
| 1 | Reading and displaying of image (Various image file format) and to understand the notion of connectivity and neighborhood defined for a point in an image. |
| 2 | Simple gray level transformation |
| 3 | Histogram processing |
| 4 | Image transforms |
| 5 | Image arithmetic operations |
| 6 | Image smoothening operation |
| 7 | Edge detection |
| 8 | Morphological operation |
| 9 | Segmentation using thresholding |
| 10 | image compression |
| 11 | Color image Processing |

**GUIDELINES TO PAPER SETTER:**

**In theory ESE examination of 70 marks following points should be considered:**

Q.1 MCQ's based on complete syllabus. (Carries14 Marks)

Q.2 based on unit no 1, 2, 3 (Carries 14 Marks)

Q.3 based on unit no 1, 2, 3 (Carries 14 Marks)

Q.4 based on unit no 4, 5, 6 (Carries 14 Marks)

Q.5 based on unit no 4, 5, 6 (Carries 14 Marks)

**SHIVAJI UNIVERSITY, KOLHAPUR**

**ELECTRONICS ENGINEERING**

**SUBJECT NAME: SPEECH PROCESSING (Elective-I)**

**Course Details**

| | |
|---|---|
| **Class** | **Final Year B. Tech. Sem-VII** |
| **Course Code and Course Title** | **PCE-EN701: Speech Processing (Elective-I)** |
| **Prerequisites** | **Digital Signal Processing** |
| **Teaching scheme: Lectures + Tutorial** | **3 Hrs. + 1 Hr.** |
| **Credits** | **3 + 1** |
| **Evaluation Scheme ESE + CIE for Theory** | **70 (ESE) + 30 (CIE)** |

| **Teaching scheme** | **Examination scheme** |
|---|---|
| **Lectures: 3 Hrs. /Week** | **Theory: 100 Marks, 70 (ESE) + 30 (CIE)** |
| **Tutorial: 1 Hr./Week** | **TW: 25 Marks** |

| **Course Objectives:** The course aims to | |
|---|---|
| 1 | Understand basic acoustic theory and time domain models for speech processing.. |
| 2 | Understand sampling, quantization and different modulation techniques. |
| 3 | Understand STFT analysis , Homomorphism Speech processing and speech synthesis |
| 4 | Understand Linear predictive coding to enhance speech quality |
| 5 | Understand different techniques to enhance speech quality |

| **Course Outcomes:** Upon successful completion of this course, the students will be able to: | |
|---|---|
| 1 | Explain the acoustic theory. |
| 2 | Apply sampling, quantization and different modulation techniques. |
| 3 | Perform STFT analysis, Homomorphic Speech processing and speech synthesis |
| 4 | Apply Linear predictive coding to enhance speech quality |
| 5 | Apply different techniques to enhance speech quality |

| COURSE CONTENTS | | |
|---|---|---|
| **Unit No.1** | **DIGITAL MODELS FOR THE SPEECH SIGNAL**: Process of speech production, Acoustic theory of speech production, Lossless tube models, and Digital models for speech signals. Time domain models for speech processing: Time dependent processing of speech, Short time energy and average magnitude, Short time average zero crossing rate, Speech vs silence discrimination using energy & zero crossings, Pitch period estimation, Pitch period estimation using autocorrelation function, Median smoothing. | **6 Hrs.** |
| **Unit No.2** | **DIGITAL REPRESENTATIONS OF THE SPEECH WAVEFORM:** Sampling speech signals, Instantaneous quantization, Adaptive quantization, Differential quantization, Delta Modulation, Differential PCM, Comparison of systems, direct digital code conversion. | **5 Hrs.** |
| **Unit No.3** | **SHORT TIME FOURIER ANALYSIS:** Linear Filtering interpretation, Filter bank summation method, Overlap addition method, Design of digital filter banks, Implementation using FFT, Spectrographic displays, Pitch detection, Analysis by synthesis, Analysis synthesis systems. | **7 Hrs.** |
| **Unit No.4** | **HOMOMORPHIC SPEECH PROCESSING:** Homomorphic systems for convolution, complex cepstrum, Pitch detection, Formant estimation, Homomorphic vocoder. | **5 Hrs.** |
| **Unit No.5** | **LINEAR PREDICTIVE CODING OF SPEECH:** Basic principles of linear predictive analysis, Solution of LPC equations, Prediction error signal, Frequency domain interpretation, Relation between the various speech parameters, Synthesis of speech from linear predictive parameters, Applications. | **6 Hrs.** |
| **Unit No.6** | **SPEECH ENHANCEMENT:** Spectral subtraction & filtering, Harmonic filtering, parametric re-synthesis, Adaptive noise cancellation. **SPEECH SYNTHESIS:** Principles of speech synthesis, Synthesizer methods, Synthesis of intonation, Speech synthesis for different speakers, Speech synthesis in other languages, Evaluation, Practical speech synthesis. | **7 Hrs.** |

**TEXT BOOKS:**


| | |
|---|---|
| 1 | L. R. Rabiner and R. W. Schafer, “Digital Processing of Speech Signals," Pearson Education (Asia) Pte. Ltd., 2004. |
| 2 | Z. Li and M.S. Drew, “Fundamentals of Multimedia,” Pearson Education (Asia) Pvt. Ltd., 2004. |
| 3 | L. R. Rabiner and B. Juang, “Fundamentals of Speech Recognition,” Pearson Education (Asia) Pte. Ltd., 2004 |


**REFERENCE BOOKS:**


| | |
|---|---|
| 1 | C Becchetti& L P Ricotti, “Speech Recognition Theory & C++ Implementation” John Wiley & Sons. |
| 2 | Speech and audio processing by Dr. Shaila D. Apte |
| 3 | B. Gold & N. Morgan “Speech & Audio Signal Processing”, John Wiley & Sons. |
| 4 | D. O’Shaughnessy, “Speech Communication Human & Machine”, Universities Press. |


**NOTE: Minimum Eight (8) Tutorials based on above syllabus.**

**GUIDELINES TO PAPER SETTER:**

**In theory ESE examination of 70 marks following points should be considered:**

Q.1 MCQ’s based on complete syllabus. (Carries14 Marks)

Q.2 based on unit no 1, 2, 3 (Carries 14 Marks)

Q.3 based on unit no 1, 2, 3 (Carries 14 Marks)

Q.4 based on unit no 4, 5, 6 (Carries 14 Marks)

Q.5 based on unit no 4, 5, 6 (Carries 14 Marks)

**SHIVAJI UNIVERSITY, KOLHAPUR**

**ELECTRONICS ENGINEERING**

**SUBJECT NAME: RADAR & NAVIGATION (ELECTIVE-I)**

**Course Details**

| | |
|---|---|
| **Class** | **Final Year B. Tech. Sem-VII** |
| **Course Code and Course Title** | **PCE-EN701: Radar & Navigation (Elective-I)** |
| **Prerequisites** | **Antenna Wave Communication** |
| **Teaching scheme: Lectures +Tutorial** | **3 Hrs. + 1 Hr.** |
| **Credits** | **3 + 1** |
| **Evaluation Scheme ESE + CIE for Theory** | **70 (ESE) + 30 (CIE)** |

| **Teaching scheme** | **Examination scheme** |
|---|---|
| **Lectures: 3 Hrs./Week** | **Theory: 100Marks, 70 (ESE) + 30 (CIE)** |
| **Tutorial: 1 Hr./Week** | **TW: 25 Marks** |

| **Course Objectives:** The course aims : | |
|---|---|
| 1 | To gain in depth knowledge about fundamental of radar |
| 2 | To study different types of radar and their operations |
| 3 | To gain knowledge radar's measurement and tracking |
| 4 | To become familiar with radar networking |

| **Course Outcomes:** Upon successful completion of this course, the student will be able to: | |
|---|---|
| 1 | Acquired knowledge about radar and radar equation |
| 2 | Understanding the working principal of Doppler radar |
| 3 | Ability to work for measurement and tracking signal |
| 4 | Foster ability to work instrument landing system |

| COURSE CONTENTS | | |
|---|---|---|
| **Unit No.1** | **ELEMENTARY CONCEPTS:**<br>Fundamental Elements of Radar, Function Performed by Radar, Overall System Considerations, Types of Radar Targets, Radar Waveform, Power and Energy, Some Basic Principles, Some Definitions | **5 Hrs.** |
| **Unit No.2** | **ANTENNAS:**<br>Aperture Antennas, Radiation Intensity Pattern, Pattern Function Relationship, Fundamental Pattern Parameters, Apertures with constant Polarization, Factorable Illumination Function, Side lobe Control in One-Dimensional Apertures, Cirularly Symmetric Illumantions, Some Example Antennas, Of The Reflector, Array Antennas, Rectangular Planner Array, Linear Array | **7 Hrs.** |
| **Unit No.3** | **RADAR EQUATION:**<br>Radar Equation, Important Networks Definition, Incremental Modeling Of Noise Sources, Incremental Modeling Of Noisy Networks, Practical Modeling Of Noisy Sources and Networks | **6 Hrs.** |
| **Unit No.4** | **RADAR SIGNALS AND NETWORKS:**<br>Real Radar Signals, Complex Radar Signals, Analytic Radar Signals, Frequency and Bandwidth Of Signals, Transmission Of Signals through Networks, Matched Filter For Nonwhite and white Noise, Ambiguity Function, Examples Of Uncertainty Functions. | **7 Hrs.** |
| **Unit No.5** | **RADAR RESOLUTION:**<br>Range Resolution, Doppler Frequency Resolution, Simultaneous Range and Doppler Resolution, Resolution and RMS Uncertainty, Overall Radar and Angle Resolution. | **5 Hrs.** |
| **Unit No.6** | **FREQUENCY MEASUREMENT AND TRACKING**:<br>Definition Of Optimum Frequency Measurement, Optimum Filter For Doppler Measurement, Some Practical Considerations, Practical Non coherent Implementation For Doppler, Optimum Coherent Doppler Measurement | **6 Hrs.** |

## REFERENCE BOOKS:


| | |
|---|---|
| **1** | "Radar Principles" By Peyton Z., Peebles, Jr. Wiley India |
| **2** | Introduction of Radar system By Skolnik (McGraw Hill) |

**NOTE: Minimum Eight (8) Tutorials based on above syllabus.**

**GUIDELINES TO PAPER SETTER:**

**In theory ESE examination of 70 marks following points should be considered:**

Q.1 MCQ's based on complete syllabus.(14 Marks)

Q.2 Based on unit no 1,2,3 (Carries 14 marks)

Q.3 Based on unit no 1,2,3 (Carries 14 marks)

Q.4 Based on unit no 4,5,6 (Carries 14 marks)

Q.5 Based on unit no 4,5,6 (Carries 14 marks**)**

**SHIVAJI UNIVERSITY, KOLHAPUR**

**ELECTRONICS ENGINEERING**

**SUBJECT NAME: JAVA SCRIPT (ELECTIVE-I)**

**Course Details**

| | |
|---|---|
| **Class** | **Final Year B. Tech. Sem-VII** |
| **Course Code and Course Title** | **PCE-EN701:Java Script (Elective-I)** |
| **Prerequisites** | **C, C++ and Python Programming** |
| **Teaching scheme: Lectures +Tutorial** | **3 Hrs. + 1 Hr.** |
| **Credits** | **3 + 1** |
| **Evaluation Scheme ESE + CIE for Theory** | **70 (ESE) + 30 (CIE)** |

| **Teaching scheme** | **Examination scheme** |
|---|---|
| **Lectures: 3 Hrs. /Week** | **Theory: 100 Marks, 70 (ESE) + 30 (CIE)** |
| **Tutorial: 1 Hr./Week** | **TW: 25 Marks** |

| **Course Objectives:** The course aims to : | |
|---|---|
| 1 | Introduce students to emerging web technologies. |
| 2 | Enable students to use and apply JS objects in web applications. |
| 3 | Introduce students to create and demonstrate user define functions. |
| 4 | Teach students to understand and perform user – browser interactions. |
| 5 | Teach principles of object-oriented programming paradigm. |
| 6 | Facilitate students to learn events, cookies and exceptions handling. |

| **Course Outcomes:** Upon successful completion of this course, the students will be able to: | |
|---|---|
| 1 | Identity and apply JS objects in web applications. |
| 2 | Articulate and write user define functions. |
| 3 | Describe and develop user – browser interactions. |

| | |
|---|---|
| 4 | Explain the principles of object-oriented programming paradigm. |
| 5 | Use and illustrate the events, cookies and handling exceptions. |

| COURSE CONTENTS | | |
|---|---|---|
| **Unit No.1** | **INTRODUCTION TO JAVA SCRIPT**<br>Overview of JS, Client-Side JS, Advantages and Limitation of JS, JS development tools, Keywords, Syntax, Comments, Variables, Global variable, Data types (Primitive and Non-primitive), Operators, if, if...else, if...else if...statements, Switch, Break, continue statements, For loop, For-in loop, While loop, do...while loop. | **6 Hrs.** |
| **Unit No.2** | **OBJECTS OF JAVA SCRIPT**<br>Methods for creating objects, Object properties, JS Objects- Events, Date, Math, Number, Boolean, String and Array. | **6 Hrs.** |
| **Unit No.3** | **JAVA SCRIPT FUNCTION**<br>Function definition, Syntax, Parameters, Arguments, Invocation function, Function with return value, Function objects. Function Methods, Nested Functions, Function Constructor. | **6 Hrs.** |
| **Unit No.4** | **JAVASCRIPT BOM, DOM AND VALIDATION**<br>**Browser objects**: Methods of browser objects, Window, History, Navigator, Screen objects.<br>**Documents objects:** Properties, Methods of document objects, DOM Compatibility.<br>**JS Validation:** JS form validation and JS email validation. | **6 Hrs.** |
| **Unit No.5** | **JAVASCRIPT OBJECT ORIENTED PROGRAMMING**<br>JS class, Objects, Objects methods, Prototype, Constructor methods, Static method, Encapsulation, Inheritance, Polymorphism and Abstraction. | **5 Hrs.** |
| **Unit No.6** | **JAVASCRIPT EVENT, COOKIES AND EXCEPTION HANDLING**<br>Types of events, operations using events, cookies and its fields, cookies operations, Page redirection, Exception handling, Types of errors, Debugging, Hoisting, JS Strict Mode. | **7 Hrs.** |

**TEXT BOOKS:**

| | |
|---|---|
| 1. | Java script for Beginners- by Mark Lassoff 's |
| 2. | JavaScript: The Definitive Guide- by David Flanagan, Kindle Edition |
| 3. | Eloquent JavaScript-by Marijn Haverbeke |

**REFERENCE BOOKS:**

| | |
|---|---|
| 1. | The Principles of Object-Oriented JavaScript – by Nicholas C. Zakas. |
| 2. | JavaScript and JQuery: Interactive Front-End Web Development 1st Edition- by Jon Duckett. |
| 3. | HTML, CSS, and JavaScript- by Meloni Julie C.Person Publication. |

**TUTORIALS:**

**Minimum Eight (8) tutorials to be conducted out of 12. Each tutorial should demonstrate at-least 2-3 different programs to the concern statement.**

| Sr. No. | Tutorials |
|---|---|
| 1. | Write a program to use and demonstrate the operators. |
| 2. | Write a program using looping statements (For, While, do-While, For-In). |
| 3. | Write a program to demonstrate the applications of Array. |
| 4. | Write a program to demonstrate the use of Boolean and Math objects. |
| 5. | Write a program using user define functions. |
| 6. | Write a program to create registration form and perform Validation. |
| 7. | Write a program to create class with Objects. |
| 8. | Write a program to perform Constructers. |
| 9. | Write a program to demonstrate Inheritance. |
| 10. | Write a program to demonstrate the Exception handling. |
| 11. | Write a program to demonstrate Cookies. |
| 12. | Write a program to perform Event handling. |

**GUIDELINES TO PAPER SETTER:**

**In theory ESE examination of 70 marks following points should be considered:**

Q.1 MCQ's based on complete syllabus. (Carries14 Marks)

Q.2 based on unit no 1, 2, 3 (Carries 14 Marks)

Q.3 based on unit no 1, 2, 3 (Carries 14 Marks)

Q.4 based on unit no 4, 5, 6 (Carries 14 Marks)

Q.5 based on unit no 4, 5, 6 (Carries 14 Marks)

**SHIVAJI UNIVERSITY, KOLHAPUR**

## ELECTRONICS ENGINEERING

## SUBJECT NAME: SATELLITE COMMUNICATION (ELECTIVE-I)

**Course Details**

| | |
|---|---|
| **Class** | **Final Year B.Tech. Sem-VII** |
| **Course Code and Course Title** | **PCE-EN701: Satellite Communication (Elective-I)** |
| **Prerequisites** | **Analog Communication & Digital Communication** |
| **Teaching scheme: Lectures + Tutorial** | **3 Hrs. + 1 Hr.** |
| **Credits** | **3 + 1** |
| **Evaluation Scheme ESE + CIE for Theory** | **70 (ESE) + 30 (CIE)** |

| **Teaching scheme** | **Examination scheme** |
|---|---|
| **Lectures: 3 Hrs. /Week** | **Theory: 100 Marks, 70 (ESE) +30 (CIE)** |
| **Tutorial: 1 Hr./Week** | **TW: 25 Marks** |

| **Course Objectives:** The course aims to : | |
|---|---|
| 1 | Introduce the fundamental concept in the field of satellite communication. |
| 2 | Provide understanding of satellite communication system operation, Launching Techniques. |
| 3 | Analyze, design and evaluate satellite communication subsystem. |
| 4 | Examine concept of satellite networking. |
| 5 | Outline applications of Satellite Systems in various fields |

| **Course Outcomes:** Upon successful completion of this course, the students will be able to: | |
|---|---|
| 1 | Understand Orbital aspects involved in satellite communication. |
| 2 | Understand various subsystems in satellite communication system |
| 3 | Explain and Analyze Link budget calculation. |
| 4 | Understand Satellite Network System |
| 5 | Explain Non Geostationary Satellite Systems |
| 6 | Explain different applications of Satellite Systems |

| COURSE CONTENTS | | |
|---|---|---|
| **Unit No.1** | **INTRODUCTION OF SATELLITE COMMUNICATION:** Introduction, basic concept of satellite communication, Orbital Mechanics, Look angle determination, Orbital perturbation, Orbital determination Launchers and Launch vehicles, Orbital effects in communication system performance. | **7 Hrs.** |
| **Unit No.2** | **SATELLITE SUBSYSTEM:** Introduction, Attitude and control system(AOCS), Telemetry, Tracking, Command and Monitoring, Power systems, Communication subsystem, Satellite antennas, Equipment reliability and space qualification. | **7 Hrs.** |
| **Unit No.3** | **SATELLITE LINK DESIGN:** Introduction, Basic transmission Theory, System Noise Temperature and G/T Ration, Design of Downlinks, Uplink Design, Design of specified C/N : Combining C/N and C/I values in Satellite Links.(Numerical Expected) | **6 Hrs.** |
| **Unit No.4** | **SATELLITE NETWORKS**: Reference architecture for satellite networks, basic characteristics of satellite networks, Onboard connectivity with transparent processing, analogue transparent switching, Frame organization, Window organization, On board connectivity with beam scanning. | **6 Hrs.** |
| **Unit No.5** | **LOW EARTH ORBIT AND NON GEO-STATIONARY SATELLITE SYSTEM:** Introduction, Orbit considerations, Coverage and Frequency Consideration, Delay and Throughput Consideration, Operational NGSO constellation design: Iridium, Teledesic. | **4 Hrs.** |
| **Unit No.6** | **SATELLITE APPLICATIONS:** Communication Satellite-Digital DBS TV, Satellite Radio Broadcasting, Navigation Satellite, GPS Position Location Principles, GPS Receivers and codes. Military Satellite- Directed Energy Laser Weapons, Weather Forecasting Satellite Application | **6 Hrs.** |

**TEXT BOOKS:**

| | |
|---|---|
| 1 | Satellite Communications-Timothy Pratt, Charles Bostian, Jeremy Allnut John Wiley &Sons (II Edition) (For Unit 1,2,3,5) |
| 2 | Satellite Communications-Anil k. Maine and Varsha Agaraval, Wiley Publications (All Units) |
| 3 | Satellite Technology Principles and ApplicationsAnil K. Maini and VarshaAgarawal, Wiley Publications, Third Edition (Unit 6) |

**REFERENCE BOOKS:**


| | |
|---|---|
| 1 | Satellite Communications- Dennis Roody McGraw Hill Fourth Edition (All Units) |
| 2 | Satellite Communications- Gerard Maral and Michel Bousquet, Wiley Publication ($5^{th}$Edition For Unit 4) |
| 3 | Satellite Communications systems Engineering, 2nd edition- Wilbur L. Pritchard, Henri G.Suyderhoud and Robert A. Nelson. (Unit I) |


**NOTE:**

1. **Students, as a part of their term work, should visit satellite earth station and submit a report of visit.**
2. **Minimum 8 tutorials / assignment based on above syllabus.**

**GUIDELINES TO PAPER SETTER:**

**In theory ESE examination of 70 marks following points should be considered:**

Q.1 MCQ's based on complete syllabus. (Carries 14 Marks)

Q.2 based on unit no 1, 2, 3 (Carries 14 Marks)

Q.3 based on unit no 1, 2, 3 (Carries 14 Marks)

Q.4 based on unit no 4, 5, 6 (Carries 14 Marks)

Q.5 based on unit no 4, 5, 6 (Carries 14 Marks)

**SHIVAJI UNIVERSITY, KOLHAPUR**

**ELECTRONICS ENGINEERING**

**SUBJECT NAME: PROJECT PHASE-I**

**Course Details**

| | |
|---|---|
| **Class** | **Final Year B. Tech. Sem-VII** |
| **Course Code and Course Title** | **PW-EN701 :Project Phase-I** |
| **Prerequisites** | |
| **Teaching scheme: Lectures + Practicals** | **0 Hrs. + 4 Hrs.** |
| **Credits** | **0 + 2** |
| **Evaluation Scheme ESE + CIE for Theory** | **-** |

| **Teaching scheme** | **Examination scheme** |
|---|---|
| **Lectures:** | **-** |
| **Practical: 4 Hrs./Week** | **TW: 50 Marks OE: 25 Marks** |

| **Course Objectives:** The course aims to : | |
|---|---|
| 1 | Allow students to demonstrate a wide range of the skills learned at the College of Engineering during their course of study by asking them to deliver a product that has passed through the design, analysis, testing and evaluation |
| 2 | Encourage multidisciplinary research through the integration learned in a number of courses. |
| 3 | Provide a student the opportunities to apply and integrate his/her knowledge acquired throughout the undergraduate study. |

| **Course Outcomes:** After the completion of the course the student should be able to: | |
|---|---|
| 1 | Identify the problem statement through literature survey for project work. |
| 2 | Develop design strategy for the project work. |
| 3 | Develop presentation and interpersonal communication skills through project work. |
| 4 | Develop the ability to learn independently and to find/integrate information from different sources required in solving real-life problems. |
| 5 | Enhance technical report writing skills with proper organization of materials; |

1. The project is to be carried out in two semester of Final Year B. Tech (Electronics and Tele communications) Part-I and Part-II.
2. The practical batch size for project will be of 15 students. The project batch will be preferably divided into groups each consisting of not more than 3 students.
3. In semester I, group will select a project with the approval of guide and submit the synopsis of project in the first month of Semester I. The group is expected to complete detail system design, layout etc. in semester I, as a part of the term work in the form of joint report.
4. In addition all students of project groups will deliver the seminar on the proposed project only.
5. Hardcopy of project diary should be maintained Group wise, where report of every week activity should be maintained. This should be presented at the time of examination.
6. Winter/Summer Internship/Industrial Training report should be submitted along with Seminar report on Project-I and evaluation of the same will be carried out in Final year Project Phase-I as internal assessment and marks should considered in term work by respective Guide
7. Guide of the project batch should take presentation on report of Project Phase –I along with Winter/Summer Internship/Industrial Training report. They should consider marks of the same in term work of project phase-I. and give marks out of 50.

**SHIVAJI UNIVERSITY, KOLHAPUR**

**ELECTRONICS ENGINEERING**

**SUBJECT NAME: MICROWAVE ENGINEERING**

**Course Details**

| | |
|---|---|
| **Class** | **Final Year B. Tech. Sem-VIII** |
| **Course Code and Course Title** | **PCC-EN801:Microwave Engineering** |
| **Prerequisites** | **Electromagnetic Engg., Communication Engg.** |
| **Teaching scheme: Lectures + Practical** | **4 Hrs. + 2 Hrs.** |
| **Credits** | **4 + 1** |
| **Evaluation Scheme ESE + CIE for Theory** | **70 (ESE) + 30 (CIE)** |

| **Teaching scheme** | **Examination scheme** |
|---|---|
| **Lectures: 4 Hrs. /Week** | **Theory: 100 Marks,**<br>**70 (ESE) + 30 (CIE)** |
| **Practical: 2 Hr./Week** | **Term Work : 25 Marks , OE: 50 Marks** |

| **Course Objectives:**<br>The course aims to: | |
|---|---|
| 1 | Understand the basic concept of microwave engineering, and apply EM wave theory to understand the nature of microwave signal. |
| 2 | Understand the theoretical and experimental design and analysis of microwave tube devices and circuits |
| 3 | Learn the basics of Monolithic Microwave Integrated Circuits (MMIC). |
| 4 | Study Microwave semiconductor devices & applications |
| 5 | To understand various microwave measurement techniques |
| 6 | Expose students to different microwave antennas. |

| **Course Outcomes:** Upon successful completion of this course, the students will be able to: | |
|---|---|
| 1 | Analyze the microwave waveguides and passive circuit components. |
| 2 | Identify and differentiate the state of art in microwave tubes and their uses in real life |
| 3 | Identify materials used in MMIC and microwave hazards. |
| 4 | Differentiate solid state devices used in microwave based on their characteristics and Operations. |
| 5 | Measure the output power, VSWR, impedance, frequency and wavelength of microwave signal. |
| 6 | Apply the microwave antenna knowledge for industrial and scientific purposes. |

## COURSE CONTENTS

| | | |
|---|---|---|
| **Unit No.1** | **WAVE GUIDES AND MICROWAVE COMPONENTS**<br>Rectangular wave guides: TE and TM mode wave, power transmission in wave guide, power losses in wave guide, excitation of modes in wave guide. Microwave cavities, microwave hybrid circuits, directional coupler, Circulators and Isolators, microwave attenuators. (Numerical Expected). | **8 Hrs.** |
| **Unit No.2** | **MICROWAVE TUBES**<br>Microwave linear beam Tubes: Klystrons, Reentrant Cavities, Velocity-Modulation Process, Bunching Process in Klystrons, reflex klystron, slow wave structures, principle of operation of Helix Traveling-Wave Tubes (TWTs).Microwave CROSSED-FIELD TUBES: Magnetron Oscillators, Cylindrical Magnetron, Forward and backward wave crossed field amplifier(CFA). | **8 Hrs.** |
| **Unit No.3** | **MONOLITHIC MICROWAVE INTEGRATED CIRCUITS AND HAZARDS**<br>Materials: substrate, conductor dielectric & resistive MMIC growth, thin film formation, hybrid microwave I.C. fabrication, Electromagnetic compatibility, plane wave propagation in shielded rooms, anechoic chambers, microwave clean rooms, microwave hazards. | **6 Hrs.** |

| | | |
|---|---|---|
| **Unit No.4** | **MICROWAVE SOLID STATE DEVICES**<br>Microwave bipolar transistor, microwave FETs, Microwave tunnel diodes, Gunn Effect diodes, RWH Theory, LSA diodes, InP diodes, CdTe diodes, IMPATT diodes, PIN diodes, MESFETs and HEMT**.** | **8 Hrs.** |
| **Unit No.5** | **MICROWAVE MEASUREMENTS AND MICROWAVE APPLICATIONS**<br>Detection of microwave power: measurement of microwavepower bridge circuit,thermistor parameters, waveguide thermistor mounts, barraters,theory of operation of barreters,direct readingbarreters bridges, Measurement of wavelengths: single line cavity coupling system, Transmission cavity wavemeter & reaction wavemeter, measurement of VSWR, measurements of attenuation, free space attenuation, | **8 Hrs.** |
| **Unit No.6** | **MICROWAVE ANTENNAS**<br>Antenna parameters: antenna gain, directivity and beam width, Horn antenna, parabolic reflector with all types of feeding methods, slotted antenna, Lens antenna, Microstrip antennas, Corner reflector. Equations for antenna gain, directivity and beam width of all above antenna types (Numerical Expected). | **6 Hrs.** |

**TEXT BOOKS:**

| | |
|---|---|
| 1 | Samuel Liao, “Microwave Devices and Circuit”, Prentice Hall of India |
| 2 | Annapurna Das &Sisir K Das, “Microwave Engineering”, Tata Mc-Graw Hill. |
| 3 | G.S.N. Raju, “Antennas and wave propagation”, Pearson Education |

**REFERENCE BOOKS:**

| | |
|---|---|
| 1 | K. T. Matthew, “Microwave Engineering”, Wiley India, 2011 |
| 2 | Shrushut Das, “Microwave Engineering”, Oxford Press |
| 3 | M. Kulkarni, “Microwave and Radar Engineering”, Umesh Publications. |

**TERM WORK: (Minimum 8 Experiments)**

**Minimum Eight (8) Experiments based on above syllabus covering all units.**

**LIST OF EXPERIMENTS:**

| | |
|---|---|
| 1 | Study of Reflex Klystron Characteristics. |
| 2 | Study of GUNN Diode Characteristics. |
| 3 | Study of VSWR Measurement (Using Vmax / Vmin Method). |
| 4 | Study of Frequency and wavelength measurement. |
| 5 | Study of Input impedance measurement. |
| 6 | Study of E plane /H plane and magic Tee. |
| 7 | Study of Directional coupler, coupling factor. |
| 8 | Study of Horn Antenna (Gain, Radiation Pattern and beam width). |
| 9 | Study of Parabolic Antenna (Gain, Radiation Pattern and beam width). |
| 10 | Study of Measurement of attenuation (Fixed and variable). |

**GUIDELINES TO PAPER SETTER:**

**In theory ESE examination of 70 marks following points should be considered:**

Q.1 MCQ's based on complete syllabus. (Carries14 Marks)

Q.2 based on unit no 1, 2, 3 (Carries 14 Marks)

Q.3 based on unit no 1, 2, 3 (Carries 14 Marks)

Q.4 based on unit no 4, 5, 6 (Carries 14 Marks)

Q.5 based on unit no 4, 5, 6 (Carries 14 Marks)

**SHIVAJIUNIVERSITY, KOLHAPUR**

**ELECTRONICS ENGINEERING**

**SUBJECT NAME: WIRELESS COMMUNICATION**

**Course Details**

| | |
|---|---|
| **Class** | **Final Year B. Tech. Sem-VIII** |
| **Course Code and Course Title** | **PCC-EN 802: Wireless Communication** |
| **Prerequisites** | **-** |
| **Teaching scheme: Lectures +Practical** | **4 Hrs. + 2 Hrs.** |
| **Credits** | **4 + 1** |
| **Evaluation Scheme ESE + CIE for Theory** | **70 (ESE) + 30 (CIE)** |

| **Teaching scheme** | **Examination scheme** |
|---|---|
| **Lectures: 4 Hrs. /Week** | **Theory: 100 Marks, 70 (ESE) + 30 (CIE)** |
| **Tutorial: 1 Hr./Week** | **TW: 25 Marks** |

| **Course Objectives:** | |
|---|---|
| The course aims to : | |
| 1 | Focus on basic fundamentals of wireless communication. |
| 2 | Explain large & small scale radio wave propagation |
| 3 | Understand basic wireless technology |
| 4 | Understand various wireless protocols |

| **Course Outcomes:** | |
|---|---|
| Upon successful completion of this course, the students will be able to: | |
| 1 | List basic fundamentals of wireless communication |
| 2 | Analyze large & small scale radio wave propagation |

| | |
|---|---|
| 3 | Able to understand basic wireless technologies |
| 4 | Able to understand and analyze wireless concepts |

| COURSE CONTENTS | | |
|---|---|---|
| **Unit No.1** | **FUNDAMENTALS OF WIRELESS COMMUNICATION:**<br>Wireless communication system, wireless media, Frequency spectrum, Technologies in digital wireless communication, WCOM channel specifications, Types of wireless communication, challenges in WC. Cellular concept: Introduction, frequency reuse ,Channel Assignment strategies, Handoff strategies, interface and system capacity, Trunking &grade of service, Improving coverage & capacity in cellular system. | **7 Hrs.** |
| **Unit No.2** | **MOBILE RADIO PROPAGATION. LARGE SCALE PATH LOSS:**<br>Introduction to Radio Wave propagation, Free Space propagation model, Relating Power to Electric Field, The three Basic Propagation Mechanisms, Reflection, Ground Reflection (Two-Ray) Model, Diffraction, Scattering, Outdoor Propagation Models, Indoor Propagation Models. | **8 Hrs.** |
| **Unit No.3** | **MOBILE RADIO PROPAGATION SMALL-SCALE FADING AND MULTIPATH**<br>Small-Scale Multipath Propagation, Impulse Response Model of a Multipath Channel, Small-Scale Multipath Measurements, Parameters of Mobile Multipath Channels, Types of small-Scale Fading. | **8 Hrs.** |
| **Unit No.4** | **WIRELESS NETWORKING:INTRODUCTION TO WIRELESS NETWORKS**<br>Difference Between Wireless and Fixed Telephone Networks, Development of Wireless Networks, Fixed Network Transmission Hierarchy, Traffic Routing in Wireless Networks, Common Channel Signaling (CCS), Architecture of B-ISDN & services, | **9 Hrs.** |
| **Unit No.5** | **WIRELESS LAN & BLUETOOTH**<br>Introduction, Infrared radio transmission infrastructure and adhoc networks, Detailed study of IEEE 802.11, Bluetooth, Wireless ATM. | **7 Hrs.** |
| **Unit No.6** | **WIRELESS ACCESS PROTOCOL**<br>WAP (Wireless Application Protocol) architecture, Wireless Datagram, Wireless Transport layer security, wireless transaction, Wireless Session, Wireless Application Environment, WML | **7 Hrs.** |

**TEXT BOOKS:**

| | |
|---|---|
| 1 | Wireless Communications Principals & Practice- Theodore S. Rappaport, (P.E.) |
| 2 | Mobile Communications: Jachen Schiller ( Addison Westy) |
| 3 | Wireless and Mobile Networks Concept and protocols – Dr. Sunil kumar S Manvi Wiley India |

**REFERENCE BOOKS:**

| | |
|---|---|
| 1 | Wireless Networks by P. Nicopolitidis, M. S. Obaidat, G. I. Papadimitriou, A. S.Pomportsis; Wiley Pub. |
| 2 | Wireless Communication & Networks by William Stallings( Pearson Edition) |
| 3 | Wireless communication and Networks by Upena Dalal( Oxford) |

**LIST OF EXPERIMENTS: (ANY EIGHT (8) EXPERIMENTS)**

| | |
|---|---|
| 1 | Study of ISDN Trainer kit Hardware & Software Setup. |
| 2 | Study of Architecture of ISDN kit. |
| 3 | Study of Analog & Digital Subscriber Link establishment using ISDN trainer kit. |
| 4 | Study of numbering plans in ISDN trainer kit. |
| 5 | Study of Establishment point to point & Multidraft Links using ISDN. |
| 6 | Study of Protocol Analysis (based on any protocol). |
| 7 | Study of Mobile Communication Set up (Study of Link Mobile Trainer Kit , Handset). |
| 8 | Study of Multiple Access Techniques ( Any one). |
| 9 | Visit to Mobile Company Like BSNL , AIRTEL , Idea. |
| 10 | Implementation of outdoor propagation Model (Any one) using Matlab. |
| 11 | Implementation of Free Space propagation model using Matlab |

**GUIDELINES TO PAPER SETTER:**

**In theory ESE examination of 70 marks following points should be considered:**

Q.1 MCQ's based on complete syllabus. (Carries14 Marks)

Q.2 based on unit no 1, 2, 3 (Carries 14 Marks)

Q.3 based on unit no 1, 2, 3 (Carries 14 Marks)

Q.4 based on unit no 4, 5, 6 (Carries 14 Marks)

Q.5 based on unit no 4, 5, 6 (Carries 14 Marks)

**SHIVAJI UNIVERSITY, KOLHAPUR**

**ELECTRONICS ENGINEERING**

**SUBJECTNAME: POWER ELECTRONICS & DRIVES**

**Course Details**

| | |
|---|---|
| **Class** | **Final Year B. Tech. Sem-VIII** |
| **Course Code and Course Title** | **PCC-EN803 : Power Electronics & Drives** |
| **Prerequisites** | **Power Electronics** |
| **Teaching scheme: Lectures+ Practical** | **4 Hrs. + 2 Hrs.** |
| **Credits** | **4 + 1** |
| **Evaluation Scheme ESE + CIE for Theory** | **70 (ESE) + 30 (CIE)** |

| **Teaching scheme** | **Examination scheme** |
|---|---|
| **Lectures: 4 Hrs. /Week** | **Theory: 100 Marks, 70 (ESE) + 30 (CIE)** |
| **Practical : 2 Hrs./Week** | **TW: 25 Marks, POE : 50 Marks** |

| **Course Objectives:** The course aims to : | |
|---|---|
| 1 | Motive the students to develop the knowledge about various configurations of three phase Controlled Rectifiers. |
| 2 | Motive the students to develop the knowledge about various configurations of cycloconverter. |
| 3 | Enable students to gain knowledge and understanding aspects of three phase inverter. |
| 4 | Enable students to gain knowledge and understanding of ac & dc drives. |
| 5 | Applying simulation tools and methodologies for a design of power converter circuits. |

| **Course Outcomes:** | |
|---|---|
| Upon successful completion of this course ,the students will be able to: | |
| 1 | Ability to analyze and evaluate the three phase controlled converter. |
| 2 | Ability to build power electronic circuits using simulation tools. |
| 3 | Understand the fundamental principles and applications ac drives & dc drives. |
| 4 | Ability to design, analyze and understand the operation of inverter & cycloconverter. |

| **COURSE CONTENTS** | | |
|---|---|---|
| **Unit No.1** | **3-PHASE CONTROLLED RECTIFIERS.**<br>Concepts of 3-phase, half wave controlled rectifier with R load, half controlled and full controlled converter with RL load (continuous and discontinuous current mode of operation). Effect of source inductance on performance of 3-phase converters, mathematical analysis all above converter topologies are expected. Numerical are expected only on full controlled converter for various modes. | **9 Hrs.** |
| **Unit No.2** | **3 PHASE INVERTERS**<br>IGBT based inverters: 3-phase bridge inverter (120 and 180 mode of conduction) Voltage control of 3-phase inverter, comparison of VSI and CSI inverter. Numerical are expected voltage controlled techniques of inverters. | **5 Hrs.** |
| **Unit No.3** | **CYCLO-CONVERTERS**<br>Introduction to cyclo-converters, 1-phase to 1-phase, 3-phase to 1-phase, 3-phase to 3- phase: bridge configuration and circulating and non-circulating mode of operation for 1 phase midpoint configuration.<br>Harmonic reduction techniques. | **6 Hrs.** |
| **Unit No.4** | **FUNDAMENTALS OF ELECTRIC DRIVES**<br>Block diagram of an electric drive, parts of electric drive, and selection criteria of electric drives, comparison of D.C. and A.C. drive, adjustable speed drive.<br>D.C. motor: starting and breaking, conventional speed control methods.<br>A.C. Motor: starters for 3 phase induction motor –D.O.L., star-delta starter, autotransformer starter, rotor resistance starter, speed control methods. | **8 Hrs.** |
| **Unit No.5** | **D.C. MOTOR CONTROL**<br>Equivalent circuit, speed torque characteristics of D.C. Motor, operating modes, regenerative braking, dynamic braking, plugging, constant torque and constant power control, three phase controlled rectifier fed drives, | **6 Hrs.** |

| | | |
|---|---|---|
| | four quadrant chopper drive. Numerical are expected on above mentioned chopper fed drive. | |
| **Unit No.6** | **A.C. MOTOR CONTROL**<br>Starting, braking, speed control, Equivalent circuit, speed torque characteristics of induction motor, speed control methods: stator voltage control ,rotor voltage control, frequency control(V/F); slip power recovery scheme-Scherbius drive, VSI Fed induction motor drive. | **6 Hrs.** |

**TEXT BOOKS:**

| | |
|---|---|
| 1 | P.C.Sen, "Power Electronics", Tata McGraw-Hill Education. |
| 2 | M.D. Singh, K.B. Khanchandani, "Power Electronics", 2nd Edition, Tata- McGraw Hill |
| 3 | G.K.Dubey , "Fundamentals of Electrical Drives". |

**REFERENCE BOOKS:**

| | |
|---|---|
| 1 | M.H. Rashid, "Power Electronics", 3rd Edition, Pearson |
| 2 | Ned Mohan, "Power Electronics ", Wiely Publication |
| 3 | V.R.Moorthi, Shephard, "Power Electonics & motor Control**",** 2nd Edition, Cambridge Publication. |

**LIST OF EXPERIMENTS: PART-I: HARDWARE**

| | |
|---|---|
| 1 | Study of 3 phase full controlled converter with R load. |
| 2 | Study of 3 phase half controlled converter with R load. |
| 3 | Study of 3 phase inverter. |
| 4 | Study of single phase to single phase cyclo-converter. |
| 5 | Study of speed control of DC motor. |
| 6 | Study of four quadrant chopper fed DC drive. |
| 7 | Study of speed control of AC motor. |
| 8 | Simulation of 3 Phase Rectifier. |
| 9 | Simulation of 3 Phase Inverter. |
| 10 | Simulation of Cyclo-converter. |

**PART-II: SOFTWARE**

Minimum 3 simulation based experiments by using software tools like matlab/labview/scilab etc.

**NOTE**: **Minimum Eight experiments are to be conducted from Hardware and Software.**

**GUIDELINES TO PAPER SETTER:**

**In theory ESE examination of 70 marks following points should be considered:**

Q.1 MCQ's based on complete syllabus. (Carries14 Marks)

Q.2 based on unit no 1, 2, 3 (Carries 14 Marks)

Q.3 based on unit no 1, 2, 3 (Carries 14 Marks)

Q.4 based on unit no 4, 5, 6 (Carries 14 Marks)

Q.5 based on unit no 4, 5, 6 (Carries 14 Marks)

**SHIVAJI UNIVERSITY, KOLHAPUR**

**ELECTRONICS ENGINEERING**

**SUBJECTNAME: HIGH PERFOMANCE COMMUNICATION NETWORKS**

**(ELECTIVE-II)**

**Course Details**

| | |
|---|---|
| **Class** | **Final Year B.Tech. Sem-VIII** |
| **Course Code and Course Title** | **PCE-EN801: High Performance Communication Networks (Elective-II)** |
| **Prerequisites** | **Computer Networks, Digital Communication** |
| **Teaching scheme: Lectures+ Tutorial** | **3 Hrs.+ 1 Hr.** |
| **Credits** | **3 + 1** |
| **Evaluation Scheme ESE + CIE for Theory** | **70 (ESE) +30 (CIE)** |

| **Teaching scheme** | **Examination scheme** |
|---|---|
| **Lectures: 3 Hrs. /Week** | **Theory: 100 Marks, 70 (ESE) +30 (CIE)** |
| **Tutorial: 1 Hr./Week** | **TW: 25 Marks** |

| **Course Objectives:** The course aims to : | |
|---|---|
| 1 | To provide students with an overview of the concepts and fundamentals of different communication networks |
| 2 | To study and utilize the frame formats used in communication networks. |
| 3 | Acquire the knowledge of the interoperability of networks. |
| 4 | To understand the different advanced networks architecture and functionality. |

| **Course Outcomes:** Upon successful completion of this course, the students will be able to: | |
|---|---|
| 1 | Illustrate the different communication networks using the architecture and frames format |
| 2 | Design and analyzes simple communication networks. |
| 3 | Compare various high performance networks. |
| 4 | Develop and research on various networks and its interoperability. |

| **COURSE CONTENTS** | | |
|---|---|---|
| **Unit No.1** | **HISTORY OF COMMUNICATION NETWORK**<br>History of Communication Networks, Networking principles, Review ofTCP/IP, Switching, Routing. Future networks Internet, FDDI-DQDB- SMDS, Overview of ISDN & BISDN | **6 Hrs.** |
| **Unit No.2** | **NETWORK SERVICES AND LAYERED ARCHITECTURE**<br>Traffic characterization and quality of services, Network services, High performance networks, Network Elements., Layered applications, Open data network model, Network architectures, Network bottlenecks. | **6 Hrs.** |
| **Unit No.3** | **ATM**<br>Main features of ATM, Addressing, signaling and Routing, ATM headerstructure, ATM AAL, Internetworking with ATM. | **5 Hrs.** |
| **Unit No.4** | **ADVANCED NETWORKS CONCEPTS**<br>VPN-Remote-Access VPN, site-to-site VPN, Tunneling to PPP, Security in VPN.MPLS -operation, Routing, Tunneling and use of FEC, Traffic Engineering, MPLS based VPN, overlay networks-P2P connections. | **6 Hrs.** |
| **Unit No.5** | **OPTICAL NETWORKS**<br>Optical Links, WDM system, Optical cross-connects, Optical LANs, Opticalpaths and networks | **5 Hrs.** |
| **Unit No. 6** | **VEHICULAR NETWORKS**<br>Basic Principles and Challenges, Enabling Technologies - Communication requirements, Vehicular positioning, Vehicle sensors, Cooperative System Architecture, Routing Protocols for VANET, VANET-enabled Active SafetyApplications - Infrastructure-to-vehicle applications, Vehicle-to-vehicleapplications, Pedestrian-to-vehicle applications | **8 Hrs.** |

**TEXT BOOKS:**

| | |
|---|---|
| 1 | William Stallings, **"ISDN and Broadband ISDN with Frame Relay and ATM"**, 4thEdition Pearson. |
| 2 | Leon Gracia, Indra Widjaja, **"Communication Networks-Fundamental conceptsand Key architectures"**, McGraw Hill Companies. |
| 3 | H. Hartenstein and K. P. Laberteaux, **"VANET: Vehicular Applications andInterNetworking Technologies"**, Wiley, 2010. |

**REFERENCE BOOKS:**

| | |
|---|---|
| 1 | Behrouz Forouzan, **"Data Communications and Networking"**, 4th Edition, McFrawHill Companies . |
| 2 | Forouzan, **"TCP/IP Protocol Suite",** III$_{rd}$ Edition Tata Mc-Graw Hill publication. |
| | P. H.-J. Chong, I. W.-H. Ho, **"Vehicular Networks: Applications, PerformanceAnalysis and Challenges"**, Nova Science Publishers, 2019. |

**Note: Minimum Eight (8) Tutorials based on above syllabus.**

**GUIDELINES TO PAPER SETTER:**

**In theory ESE examination of 70 marks following points should be considered:**

Q.1 MCQ's based on complete syllabus. (Carries14 Marks)

Q.2 based on unit no 1, 2, 3 (Carries 14 Marks)

Q.3 based on unit no 1, 2, 3 (Carries 14 Marks)

Q.4 based on unit no 4, 5, 6 (Carries 14 Marks)

Q.5 based on unit no 4, 5, 6 (Carries 14 Marks)

**SHIVAJI UNIVERSITY, KOLHAPUR**

**ELECTRONICS ENGINEERING**

**SUBJECT NAME: ADVANCED NETWORK SECURITY**

**(ELECTIVE-II)**

**Course Details**

| | |
|---|---|
| **Class** | **Final Year B.Tech. Sem-VIII** |
| **Course Code and Course Title** | **PCE-EN 801: Advanced Network Security (Elective-II)** |
| **Prerequisites** | **Modular arithmetic , Number theory , Computer network** |
| **Teaching scheme: Lectures +Tutorial** | **3 Hrs. + 1 Hr.** |
| **Credits** | **3 + 1** |
| **Evaluation Scheme ESE + CIE for Theory** | **70 (ESE) + 30 (CIE)** |

| **Teaching scheme** | **Examination scheme** |
|---|---|
| **Lectures: 3 Hrs. /Week** | **Theory: 100 Marks, 70 (ESE) + 30 (CIE)** |
| **Tutorial: 1 Hr./Week** | **TW: 25 Marks** |

| **Course Objectives:** The course aims to : | |
|---|---|
| 1 | Introduce students to security challenges, access control models, authentication and authorization |
| 2 | Introduce students to malware and social engineering attacks, network authentication and identity management |
| 3 | Familiarize students with physical security and hardware security. |
| 4 | Familiarize students with web application attacks and Internet browsers, wireless network security attacks, vulnerabilities and solutions. |

| **Course Outcomes:** Upon successful completion of this course, the students will be able to: | |
|---|---|
| 1 | Develop Concept of Security needed in Communication of data through computers and networks along with Various Possible Attacks. |
| 2 | Understand Various Encryption mechanisms for secure transmission of data and management of key required for required for encryption. |
| 3 | Understand authentication requirements and study various authentication mechanisms. |
| 4 | Understand network security concepts and study different Web security mechanisms. |

| **COURSE CONTENTS** | | |
|---|---|---|
| **Unit No.1** | **INTRODUCTION**<br>Need for Security , Security Attacks ,Services and Mechanisms ,Network Security Mode. | **5 Hrs.** |
| **Unit No.2** | **SYMMETRIC CIPHERS**<br>Substitution &Transposition Techniques , Block Cipher , DES , Triple DES , AES ,Stream Ciphers , RC4 | **6 Hrs.** |
| **Unit No.3** | **PUBLIC KEY CRYPTOGRAPHY**<br>Need and Principles of Public Key Cryptosystems, RSA Algorithm, Key Distribution and Management, Diffie-Hellman Key Exchange, Digital Signatures. | **7 Hrs.** |
| **Unit No.4** | **AUTHENTICATION**<br>Authentication Requirements, Message Authentication Codes, Hashes, MD5 & SHA ,User Authentication: Password, Certificate based & Biometric Authentication , Kerberos. | **7 Hrs.** |
| **Unit No.5** | **NETWORK SECURITY**<br>Firewalls , IP Security , Electronic Mail Security , Intrusion Detection , Web Security , SSL, TLS | **6 Hrs.** |
| **Unit No.6** | **NETWORK TOOLS**<br>Network security Monitoring Tools, Encryption Tools, Web Vulnerability Scanning Tools, Packet Sniffers and Password Auditing Tools, Network Defense Wireless Tools, Network Intrusion & Detection Tools, One case Study using Tools. | **5 Hrs.** |

**TEXT BOOKS:**

| | |
|---|---|
| 1 | William Stallings, “Cryptography and network security principles and practices”, Pearson, 6th Edition, ISBN : 978-93-325-1877-3 |
| 2 | Atul Kahate, “Cryptography and Network Security”, Mc Graw Hill Publication, 2nd Edition, 2008, ISBN : 978-0-07-064823-4 |
| 3 | Forouzan, “Cryptography and Network Security (SIE)”, Mc Graw Hill, ISBN, 007070208X, 9780070702080 |

**REFERENCE BOOKS:**

| | |
|---|---|
| 1 | Wenbo Mao "Modern Cryptography, Theory & Practice", Pearson Education |
| 2 | Hoffstein, Pipher, Silvermman,"An Introduction to Mathematical Cryptography",Springer. |
| 3 | J. Daemen, V. Rijmen "The Design of Rijndael", Springer. |
| 4 | A. Joux "Algorithmic Cryptanalysis", CRC Press. |
| 5 | S. G. Telang "Number Theory", Tata Mc Graw Hill. |
| 6 | C. Boyd, A. Mathuria "Protocols for Authentication and Key Establishment", Springer. |
| 7 | Matt Bishop "Computer Security", Pearson Education. |
| 8 | Christof Paar, Jan Pelzl “Understanding Cryptography”, Springer-Verlag Berlin Heidelberg |

**NOTE: Minimum Eight (8 Tutorials based on above syllabus & one case study using tools.**

**GUIDELINES TO PAPER SETTER:**

**In theory ESE examination of 70 marks following points should be considered:**

Q.1 MCQ’s based on complete syllabus. (Carries14 Marks)

Q.2 based on unit no 1, 2, 3 (Carries 14 Marks)

Q.3 based on unit no 1, 2, 3 (Carries 14 Marks)

Q.4 based on unit no 4, 5, 6 (Carries 14 Marks)

Q.5 based on unit no 4, 5, 6 (Carries 14 Marks)

**SHIVAJI UNIVERSITY, KOLHAPUR**

**ELECTRONICS ENGINEERING**

**SUBJECT NAME: ELECTRICAL AUTOMOBILES**
**(ELECTIVE- II)**

**Course Details**

| | |
|---|---|
| **Class** | **Final Year B. Tech Sem - VIII** |
| **Course Code and Course Title** | **PCE-EN 801: Electrical Automobiles (Elective II)** |
| **Prerequisites** | **Basic Electrical &Electronics, Engineering Mathematics** |
| **Teaching scheme :Lectures + Tutorial** | **3 Hrs. + 1 Hr.** |
| **Credits** | **3 + 1** |
| **Evaluation Scheme ESE + CIE for Theory** | **70 (ESE) + 30 (CIE)** |

| **Teaching scheme** | **Examination scheme** |
|---|---|
| **Lectures : 3 Hrs. / Week** | **Theory : 100 Marks,**<br>**70 (ESE) + 30 (CIE)** |
| **Tutorial : 1 Hr. / Week** | **TW: 25 Marks** |

| **Course Objectives:**<br>The course aims to : | |
|---|---|
| 1 | Understand basics of EVs & HEVs. |
| 2 | Understand basics of battery, battery charging Systems in EVs & HEVs |
| 3 | Analyze power management and grid technology |
| 4 | Understand the construction and working principle of various motors used in electric vehicles |
| 5 | Analyze design of EV and HEV |
| 6 | Analyze the effect of changing of parameters on vehicle performance |

| **Course Outcomes:** Upon successful completion of this course, the students will be able to: | |
|---|---|
| 1 | Know the Concept of Electric Vehicles, Hybrid Electric Vehicles & Plug in Hybrid Electric Vehicles |
| 2 | Analyze the battery management system& PHEV design |
| 3 | Analyze different power converter topology used for electric vehicle application |
| 4 | Develop the electric propulsion unit and its control for application of electric vehicles |
| 5 | Design issues of EVs & HEVs |
| 6 | How to model EVs & HEVs |

| **COURSE CONTENTS** | | |
|---|---|---|
| **Unit No. 1** | **INTRODUCTION TO EVS & HEVS**<br>A brief history of EV & HEV, Basics of EV & HEV, Architectures of EV & HEV, HEV fundamentals. | **6 Hrs.** |
| **Unit No. 2** | **PLUG-IN HEVS**<br>Introduction to PHEVs, PHEV architectures, Power management of PHEVs, Fuel economy of PHEVs, PHEV design & component sizing, Vehicle-to-grid technology. | **6 Hrs.** |
| **Unit No. 3** | **POWER ELECTRONICS IN EVS & HEVS**<br>Introduction, Principles of power electronics, Rectifiers, Converters, Inverters, Battery chargers used in EVs & HEVs, Emerging power electronic devices | **6 Hrs.** |
| **Unit No. 4** | **ELECTRIC MACHINES & DRIVES IN EVS & HEVS**<br>Introduction, Induction motor drives, Permanent magnet motor drives, Brushed & Brushless DC motor, Switched reluctance motors. | **6 Hrs.** |
| **Unit No. 5** | **COMPONENTS & DESIGN CONSIDERATIONS OF EVS & HEVS**<br>Batteries, Ultra capacitors, Fuel Cells, Controls, Aerodynamic considerations, Consideration of rolling resistance, Transmission efficiency, Consideration of vehicle mass, Electric vehicle chassis & body design, General issues in design. | **7 Hrs.** |

| | | |
|---|---|---|
| **Unit No: 6** | **MODELING & CASE STUDIES OF EVS & HEVS**<br>Introduction, Fundamentals of vehicle system modeling, HEV modeling, Case studies - Rechargeable battery vehicles, Hybrid vehicles. | **5 Hrs.** |

**TEXT BOOKS:**

| | |
|---|---|
| 1 | Chris Mi, M. Abul Masrur, David WenzhongGao, "Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives", 2011, Wiley publication. |

**REFERENCE BOOKS**:

| | |
|---|---|
| 1 | Mehrdad Ehsani,Yimin Gao, Sebastien E. Gay, Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles", CRC PRESS. |
| 2 | Allen Fuhs, "Hybrid Vehicles and the future of personal transportation", 2009, CRC Press. |
| 3 | James Larminie, John Lowry, "Electric Vehicle Technology Explained", 2003, Wiley publication. |

**NOTE: Minimum Eight (8) Tutorials based on above syllabus.**

**GUIDELINES TO PAPER SETTER:**

**In theory ESE examination of 70 marks following points should be considered:**

Q.1 MCQ's based on complete syllabus. (Carries14 Marks)

Q.2 based on unit no 1, 2, 3 (Carries 14 Marks)

Q.3 based on unit no 1, 2, 3 (Carries 14 Marks)

Q.4 based on unit no 4, 5, 6 (Carries 14 Marks)

Q.5 based on unit no 4, 5, 6 (Carries 14 Marks)

**SHIVAJI UNIVERSITY, KOLHAPUR**

**ELECTRONICS ENGINEERING**

**SUBJECT NAME: BIG DATA ANALYTICS (ELECTIVE- II)**

**Course Details**

| | |
|---|---|
| **Class** | **Final Year B. Tech. Sem-VIII** |
| **Course Code and Course Title** | **PCE-EN 801: Big Data Analytics (Elective-II)** |
| **Prerequisites** | **Data Base Management System** |
| **Teaching scheme: Lectures+ Tutorial** | **3 Hrs. + 1 Hr.** |
| **Credits** | **3 + 1** |
| **Evaluation Scheme ESE + CIE for Theory** | **70 (ESE) + 30 (CIE)** |

| **Teaching scheme** | **Examination scheme** |
|---|---|
| **Lectures: 3 Hrs./Week** | **Theory: 100 Marks, 70 (ESE) + 30 (CIE)** |
| **Tutorial: 1 Hr./Week** | **TW: 25 Marks** |

| **Course Objectives:** The course aims to: | |
|---|---|
| 1 | To Provide an Overview of an exciting growing field of Big Data Analytics. |
| 2 | To introduce the tools required to manage and analyze big data like Hadoop, NoSQL, Map Reduce. |
| 3 | To teach the fundamental techniques in achieving big data analytics with scalability and streaming capability |

| **Course Outcomes:** Upon successful completion of this course, the students will be able to: | |
|---|---|
| 1 | Understand the key issues in big data management. |
| 2 | Acquire fundamental enabling techniques using tools in big data analytics. |
| 3 | Achieve adequate perspectives of big data analytics in various applications like sensor, recommender systems, social media applications etc. |

| **COURSE CONTENTS** | | |
|---|---|---|
| **Unit No.1** | **INTRODUCTION TO BIG DATA ANALYTICS:** Introduction to Big Data, Big Data characteristics, types of Big Data, Traditional vs. Big Data business approach. Technologies Available for Big Data, Infrastructure for Big Data, Big Data Challenges, Case Study of Big Data Solutions. | **4 Hrs.** |
| **Unit No.2** | **INTRODUCTION TO HADOOP:** Introduction to Hadoop. Core Hadoop Components, Hadoop Ecosystem, Physical Architecture, Hadoop limitations. | **5 Hrs.** |
| **Unit No.3** | **NOSQL:** Introduction to NoSQL, NoSQL business drivers, NoSQL case studies. NoSQL data architecture patterns: Key-value stores, Graph stores, Column family (Big table) stores, Document stores, Variations of NoSQL architectural patterns. Using NoSQL to manage big data: What is a big data NoSQL solution? Understanding the types of big data problems; Analyzing big data with a shared-nothing architecture; Choosing distribution models: master-slave versus peer-to-peer; Four ways that NoSQL systems handle big data problems | **6 Hrs.** |

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|---|---|---|
| **Unit No.4** | **MAP REDUCE:**<br>Map Reduce and The New Software Stack: Distributed File Systems, Physical Organization of Compute Nodes, Large Scale File-System Organization. Map Reduce: The Map Tasks, Grouping by Key, The Reduce Tasks, Combiners, Details of Map Reduce Execution, Coping with Node Failures. Algorithms Using Map Reduce: Matrix-Vector Multiplication by Map Reduce, Relational-Algebra Operations by Map Reduce, Matrix Operations, Matrix Multiplication by Map Reduce. | **6 Hrs.** |
| **Unit No.5** | **TECHNIQUES IN BIG DATA ANALYTICS:**<br>Finding Similar Item: Nearest Neighbor Search, Similarity of Documents, Mining Data Streams: Data Stream Management Systems, DataStream Model, Examples of Data Stream Applications: Sensor Networks, Network Traffic Analysis, Link Analysis: Page Rank Definition, Structure of the web, dead ends, Using Page rank in a search engine, Efficient computation of Page Rank: Page Rank Implementation Using Map Reduce Frequent Item set Mining : Market-Basket Model, Apriori Algorithm, Algorithm of Park-Chen-Yu | **9 Hrs.** |
| **Unit No.6** | **BIG Data Analytics Applications:**<br>Recommendation Systems: Introduction, A Model for Recommendation Systems, Collaborative-Filtering System: Nearest Neighbor Technique, Example. Mining Social-Network Graphs: Social Networks as Graphs, Types of Social-Networks. Clustering of Social Graphs: Applying Standard Clustering Techniques, counting triangles using Map Reduce. | **6 Hrs.** |

**TEXT BOOKS:**


| | |
|---|---|
| 1 | Radha Shankarmani and M Vijayalakshmi ―Big Data Analytics‖, Wiley |
| 2 | Alex Holmes ―Hadoop in Practice‖, Manning Press, Dreamtech Press |
| 3 | Dan McCreary and Ann Kelly ―Making Sense of NoSQL‖ – A guide for managers and the rest of us, Manning Press |

**REFERENCE BOOKS:**


| | |
|---|---|
| 1 | Bill Franks , ―Taming The Big Data Tidal Wave: Finding Opportunities In Huge Data Streams With Advanced Analytics‖, Wiley |
| 2 | Chuck Lam, ―Hadoop in Action‖, Dreamtech Press |


**NOTE: Minimum Eight (8) Tutorials based on above syllabus.**

**GUIDELINES TO PAPER SETTER:**

**In theory ESE examination of 70 marks following points should be considered:**

Q.1 MCQ's based on complete syllabus. (Carries14 Marks)

Q.2 based on unit no 1, 2, 3 (Carries 14 Marks)

Q.3 based on unit no 1, 2, 3 (Carries 14 Marks)

Q.4 based on unit no 4, 5, 6 (Carries 14 Marks)

Q.5 based on unit no 4, 5, 6 (Carries 14 Marks)

**SHIVAJI UNIVERSITY, KOLHAPUR**

**ELECTRONICS ENGINEERING**

**SUBJECT NAME: PROJECT PHASE-II**

**Course Details**

| | |
|---|---|
| **Class** | **Final Year B. Tech. Sem-VIII** |
| **Course Code and Course Title** | **PW-EN 801 : Project Phase-II** |
| **Prerequisites** | |
| **Teaching scheme: Lectures + Practicals** | **0 Hrs. + 8 Hrs.** |
| **Credits** | **6** |
| **Evaluation Scheme ESE + CIE for Theory** | **-** |

| **Teaching scheme** | **Examination scheme** |
|---|---|
| **Lectures: -**<br>**Tutorial : -** | **-** |
| **Practical : 8 Hr./Week** | **TW: 50 Marks OE: 150 Marks** |

1. The Project group in semester-I will continue in semester II as well and complete the project work in all respects (Assembly, Testing, Fabrication, tabulation, test result etc.)
2. The project work along with project report consisting of approximately 80 pages should be submitted as part of term work in Semester- II on or before the last day of the semester -II.
3. The project report must be submitted in the prescribed format decided by the concerned department to maintain the uniformity.
4. The project report must be duly signed by
    a. Students
    b. Guide
    c. Head of Department
    d. Head of institution
    e. External Examiner