SYLLABUSFOR B.Sc(ELECTRONICSAND COMMUNICATION)

CBCS pattern, 2021-2022onwards

MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI

REGULATIONS

DURATIONS OF THE COURSE:

Three Years divided into **Six semesters**. Each semester will be of 90 working days.

COURSE OF STUDY:

It's under CBCS (Choice Based Credit System) pattern according to the syllabus and books prescribed from time to time.

ELIGIBILITY:

As per the guidelines for the admission of Under Graduate (UG) students by Department of Collegiate Education, Chennai.

FOUNDATION SUBJECTS:

PART I: Tamil / Hindi / Malayalam as per MSU guidelines
PART II: English

ALLIED SUBJECTS:

Must choose any two allied subjects apart from the core/major subjects. (For. e.g. Mathematics, Physics, Computer Science, Information Technology (IT), Chemistry...)

SCHEME OF EXAMINATIONS:

As per the CBCS pattern with SE (Secured External Examinations score) and IA (Internal Assessment score)

QUESTION PAPER PATTERN FOR ALL UG COURSES:

THEORY PAPERS:

MARKS FOR INTERNAL: (MAX.Marks:25, Passing minimum: 10 marks)
Marks distribution:
Cycle test and model exam: 20 marks
Assignment : 5marks
Total : 25marks

MARKS FOR EXTERNAL: (Max. Marks: 75, Passing minimum: 30 marks, Time: 3 Hours)

1. Part A (10 x 1= 10 marks), Answer All questions, Two questions from each unit
2. Part B (5 x 5 = 25 marks), Answer All questions, One question from each unit with internal Choice
3. Part C (5 x 8 = 40 marks), Answer All questions, One question from each unit with internal Choice

PRACTICAL PAPERS:

TIME: 3 Hours, Maximum Marks: 50 (External) and 50 (Internal). Marks will be calculated by laboratory performance, attendance, record note book maintenance, model practical's examination.

MINI PROJECT, INERNSHIP / FIELD WORK (maximum marks): IA: 50 marks and SE: 50 marks
PROJECT WORK (maximum marks): IA: 50 marks and SE: 50 marks

Sl.No.	Category of Subjects	Contact Hrs/week	Credits	Max Marks/ ExamTime (SE:IA/ Hrs)
	SEMESTER I			
1.	Language-Tamil/Other	6	4	75:25/3
2.	Language-Communicative English	6	4	75:25/3
3.	Core Theory-1, Basic Electronic Devices	4	4	75:25/3
4.	Professional English for Physical Sciences - I	4	4	75:25/3
5.	Core- Practical I-Basic Electronic Devices Lab	3	2	50:50/3
6.	Allied-Theory- I (for Electronics & Comm.)-Introduction of C language, Allied-Theory- I (for others)-Basic Electronics	3	3	75:25/3
7.	Allied Practical I (for Electronics & Comm.)-Programming in C Allied Practical I (for others)-Basic Electronics Lab	2	2	50:50/3
8.	Common-Environmental studies	2	2	75:25/3
	Subtotal	**30**	**25**	
	SEMESTER II			
9.	Language-Tamil/Other	6	4	75:25/3
10.	Language-Communicative English	6	4	75:25/3
11.	Core Theory-2, Digital Electronics	4	4	75:25/3
12.	Professional English for Physical Sciences - II	4	4	75:25/3
13.	Core- Practical II-Digital Electronics Lab	3	2	50:50/3
14.	Allied-Theory- II (for Electronics & Comm.)- Introduction to Python Language Allied-Theory- II (for others)-Introduction to Digital Electronics	3	3	75:25/3
15.	Allied Practical II (for Electronics & Comm) - Programming in Python Allied Practical II (for others)-Digital Electronic Circuits Lab	2	2	50:50/3
16.	Common-Value Based Education	2	2	75:25/3
	Subtotal	**30**	**25**	
	SEMESTER III			
17.	Part I-Language – Tamil / Other	6	4	75:25/3
18.	Part II-Language – English	6	4	75:25/3
19.	Core Theory- 3, Electronic Measurements and Circuit Theory	4	4	75:25/3
20.	Core Practical III- Electronic Circuits Lab - I	3	2	50:50/3
21.	Allied Theory- III (for Electronics)-Applied Mathematics, Allied Theory- III (for others)-Electronic Communication System	3	3	75:25/3
22.	Allied Practical III (for Electronics)-Simulations of Applied Mathematics Allied Practical III (for others)-Electronic Communication Lab	2	2	50:50/3
23.	Skill Based Core- Cellular Phone System	4	4	75:25/3
24.	Non-Major Electives (Select any one) 1.Applied Electric Circuits 2. Bio-medical Electronics	2	2	75:25/3
25.	Common-Yoga	2*	2*	50:50/3
	Subtotal	**30**	**25**	

*Excluding the hours & credit for Yoga & computers for digital era

	SEMESTER IV			
26.	Part I-Language- Tamil	6	4	75:25/3
27.	Part II-Language- English	6	4	75:25/3
28.	Core Theory-4, Linear Integrated Circuits	4	4	75:25/3
29.	Core Practical-IV-Linear Integrated Circuits Lab	3	2	50:50/3
30.	Allied Theory - IV (for Electronics)-Numerical methods Allied Theory - IV (for others)-Advanced Communication System	3	3	75:25/3
31	Allied Practical -IV (for Electronics)- MATLAB simulation for numerical methods Allied Practical IV(for others)-Electronic Communication Lab	2	2	50:50/3
32	Skill Based Core-Maintenance and Troubleshooting of Audio- Video Equipments	4	4	75:25/3
33	Non-MajorElectives 1.Industrial Controls (Selectanyone)2. Power Converters	2	2	75:25/3
34	Extension Activity –NCC, NSS, YRC, YWF, PE-	0	1	
35	Skill Based Common-Computers for Digital Era	2*	2*	50:50/3
36	Internship / Field work	0	2	50:50/3
	Subtotal	**30**	**28**	
	SEMESTER V			
37.	Core Theory 5, Advanced Microprocessors	4	4	75:25/3
38.	Core Theory 6, Communication Systems	4	4	75:25/3
39.	Core Theory 7, IOT based applications	4	4	75:25/3
40.	Core Theory 8, Mobile communication	4	4	75:25/3
41.	Core Practical V- Advanced Microprocessors Lab	3	2	50:50/3
42.	Core Theory Elective - I 1. Optical Display Applications (Select any one) 2. VLSI technology	4	4	75:25/3
43.	Skill Based Common- Personality Development/Effective Communication/Youth Leadership	2	2	75:25/3
44.	Mini Project	5	2	50:50/3
	Subtotal			
	SEMESTER VI	**30**	**26**	
45.	Core Theory 9, Antennas	4	4	75:25/3
46.	Core Theory 10, Optical Fiber Communication	4	4	75:25/3
47.	Core Theory 11, Artificial Intelligence	4	4	75:25/3
48.	Core Theory 12, Computer Networks	4	4	75:25/3
49.	Core Practical VI-Communication System and System Design Lab	3	2	50:50/3
50.	Core Elective – II 1. Printed CircuitBoards (Select any one) 2. Embedded System andRTOS	4	4	75:25/3
51.	Major Project	7	5	50:50/3
	Subtotal	**30**	**27**	
Total			**156**	

Total number of Credits for 3 years: 156 and 34 courses in total.
Total number of core courses: 25, 12[8+4 (Theories and Allied)] except mini & major projects + 2 skill-based core +2 skill-based-common+ 2 Electives + 6 Practical's +1 Field Work/Internship + 1 Project +1 Mini project)
Total number of Elective courses: 2 (in V and VI-semesters with having Two options in each semester, respectively), Skill based core courses:2, Skill based common courses: 5
Allied Theory + Allied Practical courses (for major students): 3+2 = 5
Allied Theory + Allied Practical courses (for other major students): 3+2 =5
Total Hours / Week = 180 for 6 semesters (i.e., 3 years)

MSU/ 2021-22 / UG-Colleges /Part-III (B.Sc. Electronics and Communication) / Semester – III / Core Theory –3

ELECTRONIC MEASUREMENTS AND CIRCUIT THEORY

LTPC
4 00 4

OBJECTIVES:

- This paper provides the knowledge of electronics, electrical and electronic measurements and circuit theory. Students can able to understand the measurements theoretically and will do the circuit design as per the electrical circuit laws and theorems.

UNIT I

BASIC ELECTRONICS AND MEASUREMENTS: Rectifiers: Half wave & Full Wave, Bridge, Inductors, Capacitors, Transformers, Amplifiers: RC coupled, multistage, Transformer coupled, Power and Feedback, Oscillators: Colpitts, Hartley, Wein bridge and phase shift oscillator.

Measurements, errors in measurements- measurement standard, Classification and characteristics of Transducers, AC/DC Bridge measurements and their applications. **(12L)**

UNIT II

MEASURING INSTRUMENTS: PMMC – DC ammeter – DC voltmeter - Voltmeter sensitivity - Ohm meter – VOM or Multimeter – Calibration Digital Voltmeters and Multimeters, AC Voltmeter-Vector Voltmeter- CRO-Block Diagram – single beam – dual trace – Sampling Oscilloscope. **(12L)**

UNIT III

DC CIRCUITS: Ohms Law-power Energy-resistors in series, parallel- Kirchoff's Laws and their applications–Branchandloopcurrents-meshandnodeanalysis-SimpleProblems. **(12L)**

UNIT IV

AC CIRCUITS: Fundamental ideas of AC circuits - impedance of RL, RC, RLC circuits-Resonance in AC circuits- series and parallel-Simple problems. **(12L)**

UNIT V

NETWORKS: Network graph of a network- concept of tree- branches and chords dual networks-Network theorems: Superposition, Thevenin, Norton, Maximum Power transfer Theorem Simple Problems. **(12L)**

(Total:60L)

TEXT BOOKS:

1. C.S.Rangan–InstrumentationDevicesandSystems,TataMcGrawHill,1998.
2. Copper–ElectronicInstrumentationandMeasurementTechniques, PHI
3. A.J.Bouwels—DigitalInstrumentation|,McGrawHill,1986
4. C.Barney–IntelligentInstrumentation,PrenticeHallofIndia,1985
5. OliverandCage–ElectronicMeasurementsandInstrumentationMcGrawHILL,1975
6. Deobelin–MeasurementsSystems|McGrawHILL,1990
7. Electronic circuits – Edminister (Schaum outline series–TMH)
8. Circuits and networks, Analysis and synthesis – A.Sudakar&S.P.Shyammohan(TMH).
9. Networks, analysis and synthesis – Umesh Sinha.
10. Electronic circuits Theory – Dr.M. Arumugam & Dr. N. Prem Kumaran (KhannaPublishers)

COURSE RESULTS: Students can able to understand and design the AC & DC circuits, measuring instruments and networks.

Semester – III / Core Practical –3

ELECTRONIC CIRCUIT LAB - I

LTPC
0 0 3 2

OBJECTIVES:

- To construct and design various electronic components practically by using electrical laws andtheorems.

1. To familiarize with basic electronic components (R, C, L, diodes, transistors), Digital Multimeter, Function Generator andOscilloscope.
2. Resistors and capacitors in series andparallel
3. Verification of Ohm'sLaw
4. Measurement of Amplitude, Frequency & Phase difference usingOscilloscope.
5. Verification of Kirchoff'slaws.
6. Verification of Thevenin'stheorem
7. Verification of Norton'stheorem.
8. Verification of SuperpositionTheorem.
9. Verification of ReciprocityTheorem.
10. Verification of Millman'stheorem.
11. Verification of Maximum Power TransferTheorem.
12. Transient Response and analysis of RLCcircuit
13. To plot frequency response of a series resonantcircuit.
14. To plot frequency response of a parallel resonantcircuit.

COURSE RESULTS:

Students will be able to design the circuits practically by using Electrical laws and Theorem

Semester – III / Allied Theory –3 (for major students)

APPLIED MATHEMATICS

L T P C
0 3 0 3

OBJECTIVES:

- This is a basic mathematics course. It provides knowledge for solving various mathematicalequations.

UNIT I
SOLUTIONS OF SYSTEM OF LINEAR EQUATIONS:

Gauss-elimination and LU-decomposition, Numerical methods for solving non-linear algebraic / transcendental. Newton's method, Secant, Regula Falsi, Jacobi Numerical solution set oflinearalgebraicequations:Jacobi,GaussSiedelandunder/overrelaxationmethods**(9L)**

UNIT II
INTERPOLATION AND EXTRAPOLATION:

Interpolation and extrapolation for equal and non-equal spaced data (Newtons Forward, Newtons backward and Lagrange) Numerical integration (trapezoidal rule, Simpson's Rule) **(9L)**

UNIT III
PROBABILITY OF STATISTICS:

Functions of random variables, probability distribution functions, expectation, moments Statistical hypothesis tests, t-tests for one and two samples, F-test, χ 2 -test Statistical Methods for Data Fitting: Linear, multi-linear, non-linearregression **(9L)**

UNIT IV
DIFFERENTIAL CALCULUS:

Higher order differentiation and Leibnitz Rule for the derivative, Taylor's and Maclaurin's theorems,Maxima/Minima,convexityoffunctions,Radiusofcurvature; **(9L)**

UNIT V
INTEGRAL CALCULUS:

Beta and Gamma functions, Differentiation under the integral sign, surface integrals, volume integrals **(9L)**

(**Total: 45L)**

TEXT AND REFERENCE BOOKS:

1. Advanced Engineering Mathematics, Erwin Kreyszig,John-Wiely
2. Advanced Engineering Mathematics S. R. K. Iyengar, R. K. Jain,Narosa
3. Introductory Methods Of Numerical Analysis, S. S. Sastry,PHI.
4. A First Course in Probability, Sheldon Ross, Pearson PrenticeHall
5. Probability and Statistics in Engineering, W.W. Hines, D. C. Montgomery, D.M. Goldsman, John-Wiely

COURSE RESULTS: Students should be able to explain basic concepts of matrix theory, numerical techniques, probability distributions and calculus of single variable. They can able to apply basic concepts of differential calculus to solve problems related to extremum, approximations, curvature etc., They can be able to apply basic numerical techniques to solve linear and nonlinear equations.

Semester – III / Allied Theory –3 (for other major students)

ELECTRONIC COMMUNICATION SYSTEMS

LTPC
3 0 0 3

OBJECTIVES: It imparts the basics of communication systems, transmitter and receiver. To understand the analog modulation and demodulation techniques. To analyze the adverse effect of noise on signals. Analyze and interpret data considering the limitations of various modulation techniques.

UNIT I

PROPAGATION OF RADIO WAVES: Introduction to EM waves – Reflection and refraction of radio waves at the surface of the earth – Ground wave propagation-Sky wave propagation – Space wave propagation – Structure of the Atmosphere – Critical frequency - Skip distance – Maximum Usable frequency (MUF) –Virtualheight. **(9L)**

UNIT II

AM GENERATION & TRANSMISSION: Need for modulation – Amplitude modulation – Frequency Spectrum of the AM Wave - Modulation Index – Power relations in the AM Wave – AM generation – AM Transmitter. - Forms of Amplitude Modulation – Evolution of SSB – Balanced Modulator–MethodsofSSBGeneration–VestigialsidebandTransmission. **(9L)**

UNIT III

FM GENERATION & TRANSMISSION: Frequency Modulation - Frequency Spectrum of the FM Wave – Modulation Index – Effect of Noise – Adjacent & Co-Channel Interference – Wide Band & Narrow Band FM-FM Generation – Direct and Indirect methods - FM Transmitter – Pre-Emphasis. **(9L)**

UNIT IV

AM & FM RECEPTION: AM Receiver – TRF Receiver – Super Heterodyne Receiver – Image Frequency Rejection – Frequency Changing & Tracking – Choice of IF – AM Detection – AGC – SSB Detection. FM Receiver – Amplitude Limiter – De-Emphasis – FM Detection – Balanced Slope Detector – Phase Discriminator –RatioDetector. **(9L)**

UNIT V

PULSE MODULATION: PAM Modulation & Detection – PWM Modulation & Detection - PPM Modulation & Detection - Sampling Theorem – Quantization & Quantization Error – PCM Modulation&Detection-Companding–ASK–FSK–BPSK–QPSK–DPSK. **(9L)**

(Total:45L)

TEXT BOOKS:

1. Electronic communication systems- Kennedy-TMH – IVedition
2. Electronic communication systems - Roddy & Collen – PHI – IVedition
3. Electronic communications – Sanjeev Gupta – Khannapublications.
4. Principles of communication engineering – Anokh Singh –S.Chand.

COURSE RESULTS: Students can apply their knowledge to engineering mathematical concepts in various communicationtechniques.

Semester – III / Allied Practical –3 (for major students)

SIMULATIONS OF APPLIED MATHEMATICS

L T P C

OBJECTIVES: **0 0 32**

- Students will understand the basics of computer programming with the exposure of excel for statistical tools, analysis for engineering applications and statistical computations such as regression, testing of hypothesis using R programming language.

List of experimental course contents are given below:

1. Basic Introduction to SpreadsheetPrograms,
2. Plotting Graphs of Functions and DataPlotting.
3. Exploring Basic Statistics, Hypothesis Testing withSpreadsheet.
4. Numerical Solution of Linear and Non-LinearEquations.
5. Basic Introduction toR
6. Exploring Distribution Function inR.
7. Hypothesis Testing inR.
8. Basic Regression Analysis inR

COURSE RESULTS: Students can carry out basic statistical mathematical analysis using excel including hypothesis testing and they can solve linear and nonlinear equations numerically using Excel. Moreover, they can understand the basic features of R programming.

Semester – III / Allied Practical –3 (for other major students)

ELECTRONIC COMMUNICATION LAB-I

LTPC
0 0 2 2

OBJECTIVES:

- This course provides the basic knowledge of communicationdevices.
- Knowledge of modulation and demodulation techniques, amplifier, oscillators, multiplexinganddifferenttypesofmodulationanddemodulationcircuitsetc.,

List of experiments:

1. Amplitude Modulation (AM) andDemodulation
2. Frequency Modulation andDemodulation
3. Amplitude Shift Keying (ASK) modulation andDemodulation
4. Frequency Shift Keying(FSK)
5. Phase Locked Loop (PLL) and FrequencyMultiplier
6. Voltage Controlled Oscillator(VCO)
7. Time Division Multiplexing using(TDM)
8. Binary Phase Shift Keying(BPSK)
9. Pulse Width Modulation(PWM)
10. Directional characteristics of micro phone and loudspeakers.
11. Measurement of Connector and Bending Losses in opticalfibers.
12. Numerical Aperture Determination for opticalFibers

COURSE RESULTS: Students had experience with the basic knowledge of communication devices, signals such as modulators, demodulators, modulation, demodulation, multiplexing and so on. They can understand about audio based device accessories (microphone, speaker and amplifier, etc..)

Semester – III / Skill based subject for major students

CELLULAR PHONE SYSTEM

LTPC

4 0 0 4

OBJECTIVES:

- This paper gives the concepts of cellular communication systems, study about different types of cell phones, messaging and different mobile standards and services.

UNIT I

THE CELLULAR SYSTEM: The cellular concept - interference Vs capacity, cell splitting, sectorization. The cellular system-mobile location, in call handover and power control in cell planning. TACS standard. The cellular network-Basestations,MSC,services. **(12L)**

UNIT II

INTRODUCTION TO MOBILE DEVICES: Device overview - Input mechanisms - keypad input, pen-based input and voice input. Mobile phone classifications - web enabled phones - Low endsmartphones-palmsizedPDA-Highendsmartphones. **(12L)**

UNIT III

CELLULAR TECHNOLOGY: Introduction - RF issues - Digital modulation - Power control - Frequency hopping. Signal processing - Digital speech coding - Channel coding and decoding. Software - Radio system software, network managementsoftware. **(12L)**

UNIT IV

MESSAGING AND SECURITY: Mobile messaging – SMS, EMS, MMS, instant messaging. Message value chain – Wireless carrier, mobile message-oriented middleware (MOM). Security threats – spoofing, sniffing,tampering,theft. **(12L)**

UNIT V

MOBILE STANDARDS: WPAN standards - IrDA, Bluetooth, 1G, 2G standards, 2.5G applications. 3G devices and applications. Network protocols - TDMA (2G), GSM (2G), CDMA one (2G), PDC 2(G), GPRS (2.5G), CDMA 2000 1x (2.5G), EDGE (3G), CDMA 2000 1xEV (3G), WCMA(G). **(12L)**

(Total:60L)

TEXT BOOKS:

1. Martyn Mallick, Mobile and Wireless Design Essentials, Wiley Publishing, Inc, New Delhi.2006.
2. R.C.V. Macario, Personal and Mobile Radio Systems, IEE Telecommunications series 25.

COURSE RESULTS: Students can able to understand the concepts of cellular communication and identify the standard system for a better communication technique from various stages of evolution. They can analyze the limitations of various mobile standards. Students can employ appropriate solutions for various issues of mobile system and network.

Semester – III / Non-Major Elective (for other major) / Select (1) or (2)

1. APPLIEDELECTRICCIRCUITS

LTPC

2 0 02

OBJECTIVES:

- The objective of this paper is to introduce the basic concepts related to the operation of electrical circuitcomponents.
- To understand basic electronic components and their effects in DC and aACcircuits.
- To apply circuit theorems to simplify and to find solutions to electricalcircuits.
- To build-up strong problem-solving skills by effectively formulate a circuit problem into a mathematical problem using circuit laws andtheorems.

UNIT I

CIRCUIT COMPONENTS: Resistors, Capacitors & Inductors in Series and Parallel - Factors governing the Resistance of a Resistor, Capacitor & Inductor - Colour Coding of Resistors - Energy Stored in a Capacitor- Energy Stored in anInductor. **(6L)**

UNIT-II

CIRCUIT LAWS: Ohms Law - Kirchoff's Voltage Law - Kirchoff's Current Law - Current Division - Voltage Division - Star Connection - Delta Connection - Series Circuits - Parallel Circuits - Series&ParallelCircuits-OpenCircuit-ShortCircuit-SimpleProblems. **(6L)**

UNIT III

THEOREMS: Super Position Theorem – Thevenin's Theorem – Norton's Theorem – Millman's Theorem Maximum PowerTransferTheorem. **(6L)**

UNIT IV

AC CIRCUIT BASICS: Sinusoidal and Non-Sinusoidal Waveforms – Peak Value – Peak to Peak Value – Average Value – RMS Value – Period and Frequency Measurement - Power Factor - Real Power –ReactivePower **(6L)**

UNIT V

RESONANCE: Capacitive Reactance – Inductive Reactance – Impedance – RL and RC in Series andParallel–RLCinSeriesandParallel–SeriesResonance-ParallelResonance **(6L)**

(Total:30L)

TEXT BOOKS:

1. Circuits And Networks: Analysis and Synthesis - Sudhakar &Shyam Mohan - TMH - IV Edition
2. Basic Electronics – Bernard Grob – McGrawHill.

COURSE RESULTS: Students could understand passive components and their working principles. It gives basic problem-solving skills towards electric circuits through organizing available information by using circuit laws

Semester – III / Non-Major Elective (for other major)

2. BIO-MEDICALELECTRONICS

LTPC

2 0 0 2

OBJECTIVES:

- This course provides the opportunity to understand the working principles of various bio-potentials,transducers,variousmeasuringinstrumentsrelatedtohumanbodycheck-up.

UNIT I

HUMAN PHYSIOLOGY: Introduction to Human Physiology – Micro Electrodes – Skin Surface Electrodes – Needle Electrodes – ReferenceElectrodes. **(6L)**

UNIT II

METERS & RECORDERS:

Digital Thermometer–Sphygmomanometer-Electronic Stethoscope-ECG – EEG - EMG. **(6L)**

UNIT III

TEST EQUIPMENT: Cardiac Stress Test Equipment – Cardiotocography - Electro Oculography - Electro Retinography - Polysomnography - Spirometer - Blood Flow Meter - Vascular Doppler–Audiometer **(6L)**

UNIT IV

OPERATION THEATRE EQUIPMENTS: Boyles Apparatus - Upper Endoscope - Lower Endoscope - ENT Endoscope–Laparoscope **(6L)**

UNIT V

DIATHERMY: Diathermy - Surgical Diathermy- Micro Wave Diathermy – Multiparameter PatientMonitor. **(6L)**

(Total:30L)

REFERENCE BOOKS:

1. Biomedical Instrumentation & Measurements – Ananda Natarajan –PHI
2. Biomedical Instrumentation and Measurements - Leslie Cromwell, Fred Weibell, Erich A.Pfeiffer - PHI - 2ndEdition.
3. Bio-Medical Instrumentation - Dr.M.Arumugam – Anuradha Agencies - 2ndEdition
4. Handbook of Biomedical Instrumentation - R.S.Khandpur –TMH.
5. Medical Instrumentation, Application and Design – John G.Webster - WEL - 3rd Edition

COURSE RESULT: Students should have understood the concept of bio- potential, bio-medical instruments, maintenance and troubleshoot instrumentation skills.

Semester – IV / Core -Theory-4

LINEAR INTEGRATED CIRCUITS

LTPC
4 0 0 4

OBJECTIVES:

- Provide the fundamental knowledge of analog IC's, differential Amplifiers, characteristics of operational amplifiers (OPAMPs), filters, wave form generators, comparators, multi-vibrators and various OPAMPapplications.

UNIT I

DIFFERENTIAL AMPLIFIERS

Differential amplifiers-dual input-balance output differential amplifier- current mirror- level translator- block diagram representation of typical op amp- interpreting a typical set of data sheets- the ideal OPAMP- equivalent circuit of an op amp- ideal voltage transfer curve.

(12L)

UNIT II

OPAMP CHARACTERISTICS

Input off set voltage – input bias current- input offset current- total output offset voltage- input and output resistance-thermal drift-CMRR-voltage shunt and voltage series feedback amplifiers.

(10L)

UNIT III

FREQUENCY RESPONSE

Frequency response of initially compensated OPAMP- circuit stability-slew rate. Filters low pass filters- high pass filters- band pass filters-band reject filters-all pass filters.

(12L)

UNIT IV

OPAMP APPLICATIONS

Adder-subtractor-Integrator-differentiator – V to I and I to V converter. Oscillator Principles-types-frequency stability phase shift oscillator-Wein bridge oscillator- square wave generator –triangular wave generator.

(14L)

UNIT V

COMPARATOR

Comparator-Schmitt trigger-clipper and clamper-peak detector-zero crossing detectors- IC-555 function block diagram-mono stable operation –Astable operation –applications

(12L)

(Total:60L)

COURSE RESULTS: Knowledge of analog integrated ICs, circuits and devices are obtained.

TEXT BOOKS:

1. Linear Integrated Circuits- D. Roychoudry&Shail Jain (New agepublications1999).
2. Operational amplifiers and linear integrated circuits -F.Couglin&Drison (4^{th} edition prentice hall ofIndia,1992).
3. Operational amplifiers and linear integrated circuits- Denton J.Dailey, McGraw Hill 1989.
4. Operational amplifiers and linear integrated circuits-Ramakant A.Gayakwad 3^{rd}editionPHI.
5. Second Edn. Operational amplifiers and Linear Ics-DavidA.Bell.

Semester – IV / Core -Practical-4

LINEAR INTEGRATED CIRCUITS LAB

LTPC
0 0 3 2

OBJECTIVES:

- Provide the experimental knowledge of analog IC's, Amplifiers, filters, Operational Amplifier (OPAMP)characteristics,multivibratorsandvariousOPAMPapplications.

1. Inverting and Non-InvertingAmplifier.
2. Integrator andDifferentiator.
3. Instrumentation Amplifier.
4. High pass, Low passfilters.
5. Band passfilter.
6. Astable multivibrator usingOPAMP.
7. Monostable multivibrator usingOPAMP.
8. Phase shift oscillator usingOPAMP.
9. Wien Bridge oscillator using OPAMP.
10. Digital to Analog Converter.
11. Analog to Digital Converter.
12. Astable Multivibrator usingIC555.
13. Monostable MultivibratorusingIC555.
14. Schmitt Trigger and Comparator using OP-AMP.
15. Design of light switch using LDR andRelay.

COURSE RESULTS: Practical skills obtained about analog integrated ICs and OPAMPs.

Semester – IV / Allied -Theory-4 (for major students)

NUMERICAL METHODS

L T P C

OBJECTIVES: **3 0 03**

- Students will understand the numerical methods, equations and analysis for engineering applications

UNIT I

Numerical solution of algebraic and transcendental equations – Bolzano's bisection method - Successive approximation method – Regula Falsi method – Newton-Raphson method. **(9L)**

UNIT II

Numerical solution of simultaneous linear algebraic equations – Gauss elimination method - Gauss Jordan elimination method – Gauss Seidel iteration method. **(9L)**

UNIT III

Finite difference operator - Interpolation – Newton-Gregory forward and backward interpolation – Newton's divided difference formula – Lagrange's interpolation formula for uneven intervals – Gauss interpolation formula – Numerical differentiation – Numerical Integration – Trapezoidal rule – Simpson's1/3rdrule. **(9L)**

UNIT IV

Numerical solutions of Ordinary differential equations of first and second order – Simultaneous equations – Taylor series method – Picard's method. **(9L)**

UNIT V

Euler's method – Improved Euler's Method - Modified Euler's Method – Runge-Kutta method of second and fourth order – Milne's predictor corrector method.

(9L)

(Total: 45L)

TEXT AND REFERENCE BOOKS:

1. Numerical Method in Science and Engineering, M.K. Venkataraman, National Publication Co, Chennai(2001)
2. Computer oriented Numerical Methods by V. Rajaram – PHI(P)Ltd.

e-Learning Source: http://ndl.iitkgp.ac.in,http://ocw.mit.edu,http://mathforum.org

COURSE RESULTS: Students can able to understand numerical methods, problems and their methods for the applications of various science and engineering solutions.

Semester – IV / Allied -Theory-4 (for other major students)

ADVANCED COMMUNICATION SYSTEM

L T P C
3 0 0 3

OBJECTIVES:

- To understand the basic concepts of digital communication systems, fiber optic systems, various wireless networks, cellular communication and satellite communication techniques.

UNIT I

DIGITAL COMMUNICATION: Basic Elements of Digital Communication System – Block Diagram-Characteristics of Data Transmission Circuits - Bandwidth Requirement – Speed - Baud Rate - Noise -Crosstalk – Distortion. Digital Codes: ASCII Code – EBCDIC Code - Error Detection Codes – Parity Check Codes – Redundant Codes - Error Correction Codes – Retransmission-Forward Error Correcting Code – HammingCode **(9L)**

UNIT II

OPTICAL FIBER COMMUNICATION: Introduction-need for OFC. Block diagram of OFC system. Fiber optic cables, light propagation through fiber-step index fiber, graded index fiber, Snell's law, numerical aperture (derivation). Types of optical fiber cables, light sources-requirements, LEDs and semiconductor laser diodes. Photo detectors -PN, PIN and avalanche photodiodes. Losses in optical fibers -Rayleigh scattering, absorption, leaky modes, bending, joint junctionlosses.AdvantagesanddisadvantagesofOFCovermetalliccables. **(9L)**

UNIT III

CELLULAR COMMUNICATION: Concept of cellular mobile communication – cell and cell splitting, frequency bands used in cellular communication, absolute RF channel numbers (ARFCN), frequency reuse, roaming and hand off, authentication of the SIM card of the subscribers, IMEI number, concept of data encryption, architecture (block diagram) of cellular mobile communication network, CDMA technology, CDMA overview, simplified block diagram of cellular phone handset, ComparativestudyofGSMandCDMA,2G,3Gand4Gconcepts. **(9L)**

UNIT IV

SATELLITE COMMUNICATION: Introduction, need, satellite orbits, advantages and disadvantages of geostationary satellites. Satellite visibility, satellite system – space segment, block diagrams of satellite sub systems, up link, down link, cross link, transponders (C- Band), effect of solar eclipse, path loss, ground station, simplified block diagram of earth station. Satellite access – TDMA, FDMA, CDMA concepts, comparison of TDMA and FDMA, Satellite antenna (parabolic dishantenna). **(9L)**

UNIT V

WIRELESS NETWORKS: Wireless LAN's Major components of local area network- Primary characteristics of Ethernet-mobile IP, OSI model, wireless LAN requirements-concept of Bluetooth, WiFiandWiMAX. **(9L)**

(Total:45L)

TEXT AND REFERENCE BOOKS:

1. Advanced Electronic Communication Systems-Wayne Tomasi, PHI 6thedition.
2. Telecommunication Systems –P.H Smale, Wheeler Publication 2ndedition.

3. Optical Fiber Communications-Gerd Kaiser, McGraw-hill 2ndedition.
4. Satellite Communications- Roddy, McGraw-hill 4thedition.
5. Electronic Communication systems, Kennedy & Davis, IVth edition-TATA McGrawHill.
6. Electronic Communication systems, Fundamentals through Advanced, Wayne Tomasi - 5th edition.

COURSE RESULTS: The outcome of the students could understand various communication techniques and can identify the required system for better communication technique.

Semester – IV / Allied -Practical-4 (for major students)

MATLAB SIMULATION FOR NUMERICAL METHODS

	L	T	P	C
OBJECTIVES:	**0**	**0**	**2**	**2**

- Students will understand the MATLAB programing and numerical methods for variousapplications

LIST OF PRACTICALS:

1. Writeaprogramtosolvealgebraicandtranscendentalequationsby Bisectionmethod
2. Write a program to solve algebraic equation and transcendental by Newton-Raphson method
3. Write a program to solve simultaneous linear algebraic equations by Gauss-Jordan method
4. Write a program to find the inverse of a matrix of order n
5. Write a program to find the determinant of a matrix of order n
6. Write a program to solve simultaneous linear algebraic equations by GaussSeidal
7. Write a program to evaluate definite integral by Trapezoidal rule
8. Write a program to evaluate definite integral by Simpson's 1/3rule
9. Write a program to solve first order ODE by Euler's method
10. Write a program to solve the first order ODE by Runge Kuttamethod

e-Learning Source:http://ndl.iitkgp.ac.in, http://ocw.mit.edu,http://mathforum.org

COURSE RESULTS: Students can able to well versed with MATLAB programming skills and numerical methods and their problems.

Semester – IV / Allied Practical - 4 (for other major students)

ELECTRONIC COMMUNICATION LAB – II

LTPC
0 0 4 2

The list of experiments is given below:

1. Voltage to frequencyconverter.
2. Study of AGC (Automatic Gain Control).
3. Study of mixercircuit.
4. Study of IFamplifier.
5. Analog signal sampling andreconstruction
6. Voltage to frequencyconverter
7. PSK, DPSK and QPSK Modulation andDemodulation
8. PCM modulation anddemodulation
9. Delta / Adaptive Delta Modulation andDemodulation
10. PPM / PAM modulation anddemodulation
11. Low high power splitter usingMATLAB.
12. Band pass and band stop filter usingMATLAB.

COURSE RESULTS: Students will be practically well versed with signals, modulation, demodulation, mixer, amplifier, and types of filters.

Semester – IV / Skill based subject

MAINTENANCE AND TROUBLE SHOOTING OF AUDIO AND VIDEO EQUIPMENTS

LTPC
4 0 0 4

OBJECTIVES:

- To understand the principles of electronic household devices, maintenance and its troubleshooting.

UNIT I

RECORDING: Recording and reproduction principles - Optical recording - Different types - Methods of recording and reproduction - Optical recording on compact disc - play back process – Advantageofcompactdisc-Troubleshootingincompactdisc **(12L)**

UNIT II

AUDIO SYSTEMS: Stereophony - Stereophonic recording on disc and reproduction - Hi-Fi Stereo reproducing system - Block diagram of Public Addressing system - Requirement of Public Addressing system - Typical PA installation planning for a public meeting - PA system for an auditorium troubleshooting inPAsystem. **(12L)**

UNIT III

TELEVISION: Monochrome, PAL colour TV transmitters Faults in TV transmitter - Testing of TV transmissions monochrome TV receiver - Fault in monochrome TV receiver - PAL colour TV receiver-FaultsincolourTVreceiver-TestingofTVreceiver. **(12L)**

UNIT IV

VIDEO DISC: Video disc format - Video recording on disk - Very High-density disk - High-definition TV system - Block diagram of MAC encoder - MAC receiver - Advantages. **(12L)**

UNIT V

DIGITAL TV: Digital TV system - Cable TV concepts set top box - Dish TV and connections - Closed circuit television - Introduction to FLAT LCD and Plasma televisionsystems. **(12L)**

(Total:60L)

TEXTBOOKS

1. Audio and Video systems Principles, Maintenance and Troubleshooting. - R.G. Gupta Tata Mc Graw Hill Publishing Co.Ltd.
2. ColourTelevisionTheoryandPractice-S.P.Bali,TataMcGrawHillPublishingCo.Ltd.

REFERENCE BOOKS

1. Electronic Instruments and systems, Principles, Maintenance andTroubleshooting- R.G. Gupta Tata Mc Graw Hill Publishing Co. Ltd.
2. Monochrome and Colour Television - R. Gulati. New Age International (P) Ltd. NewDelhi.

COURSE RESULTS: Students will have good knowledge about the household electronic devices, operation, maintenance and troubleshooting in detail.

Semester – IV / Non major Elective (for other major) / Select any one (1) or (2)

1. INDUSTRIALCONTROLS

LTPC
2 0 0 2

OBJECTIVES:

- To equip the students with basic knowledge in Industrial devices which has now become a part of every industry. The syllabus aims at a comprehensive coverage of basics of motors, starters, control system, drives, switches, sensors and protectiverelays.

UNIT I
MOTOR CONTROLS: Starting and speed control of DC Motors-Starting and speed control of AC motors-Automaticregulationsystem **(6L)**

UNIT II
CONTROL SYSTEM: Elements of automatic control system-Rotary Amplifiers-Magnetic amplifiers-ThyristorcontrolofDCandACmotorInverters-Cycloconvertors **(6L)**

UNIT III
PHASE CONTROL: Phase control of DC shunt motor-Reversible speed control of DC motor using dual converter- Chopper control of DC series motor-Slip Control-Frequency control-constant speedDCdrive **(6L)**

UNIT IV
PILOT DEVICES: Pilot devices and accessories-push button controllers& master switches-rotary selector switches-rotary control switches-over travel and limit switches-Float switches-Pressure switches and regulators-Thermostats or temperature switches-Speed governors. **(6L)**

UNIT V
RELAYS: Pluggingswitches-contactors-ElectromagneticRelays-Protectiverelays- Voltagerelay-Electromagnetic time relay-control and automation relays-Polarized electromagnetic relay-Construction and operationofelectromagneticrelay. **(6L)**

(Total:30L)

TEXTBOOK

- Utilization of Electric Power and Electric Traction-G.C Garg- KhannaPublishers

COURSE RESULTS: Upon completion of the course student will be well versed with motors and their control.

Semester – IV / Non major Elective (for other major) / Select any one (1) or (2)

2. POWERCONVERTERS

LTPC

2 0 0 2

OBJECTIVES:

- To equip the students with basic knowledge of Industrial power convertors which has now become a part of everyindustry.
- It aims at a comprehensive coverage of basics of Inverters and their operation.
- Series inverters, Parallel inverters, Converters etc. are alsodiscussed.

UNIT I

DC – AC PWM INVERTERS: DC – AC PWM inverters: Introduction – Principle of operation – performance parameters – Single phase bridgeinverters **(6L)**

UNIT II

THREE PHASE INVERTERS: Three-phase inverters – Voltage control of single-phase inverters – Voltage control of three phase inverters – Current source inverters.
(6L)

UNIT III

RESONANT PULSE INVERTERS: Resonant pulse Inverters: Introduction – Series resonant inverters–Parallelresonantinverters–ZerocurrentSwitchingresonantconverter **(6L)**

UNIT IV

ZVS RESONANT CONVERTER: Zero voltage switching resonant converter – Two quadrant ZVS resonant converter – resonant DC linkinverter **(6L)**

UNIT V

CONTROLLED CONVERTER: Principle of phase-controlled converter operation – Single phase full converter – Single phase dualconverter **(6L)**

(Total:30L)

TEXT BOOK:

Power electronics – Circuits, devices & Applications – Rashid M.H.

COURSE RESULTS: Students can be able to well-versed with all types of inverters and converters.

Semester – IV / Internship / Field Work

INTERNSHIP / FIELD WORK

L T P C

0 0 0 2

OBJECTIVES:

- To develop skills by visiting nearby industries /organizations.
- Acquire the knowledge and receive guidance from other various tasks or sources of their internship /industrial visits survey orstudy.

COURSE RESULTS:

1. Formulate and identify the real-world problem, practical difficulties, identify the requirement and develop the solutions according to their field work or internshipstudy.

2. Identify technical ideas, strategies andmethodologies.

3. Utilizethenewtools,algorithms,techniquesthatcontributetoobtainthesolutionofthework.

4. Explain the acquired knowledge through preparation of report and oral presentations.

This can be a group activity with a maximum of 5 students in one group. Students are advised to select their own internship / field work study as per the expert guidance receive from the teaching faculties of their own organization. Periodical assessment may be done to evaluate their skills.

Semester – V / Core -Theory- 5

ADVANCED MICROPROCESSORS

LTPC
4 0 0 4

OBJECTIVES:

- To understand microprocessor and microcontroller architectures, assembly language programming, interrupts, interfacing with various peripherals, timer applications and their features.

UNIT I

8085 ARCHITECTURES: Architecture of 8085 -Instruction set – Data Transfer, Arithmetic, Logical, Branching and I/O Instruction, Instruction types- various Addressing Modes. Timing sequence- Instruction cycle- Machine cycle- Halt wait state-. ALP- Mnemonic - simple Assembly language program flow chart stack and subroutines-Interrupts. **(12L)**

UNIT II

INTERFACE CONTROLLERS: Peripheral device – Programmable peripheral Interface (8255 **A)** - Programmable Interrupt controller (8259 A) - USART- Serial Communication Interface. Programmable DMA Controller (8257), Interfacing –Analog to Digital Converter- Stepper Motor – Key Board &DisplayInterface. **(12L)**

UNIT III

8051 MICROCONTROLLERS: Intel 8051 microcontroller – Block Diagram, pin out – oscillator and clock – Program Counter and Data pointer, A and B registers, flags and program status word – Internal RAM – the Stack and Stack pointer –special functions registers – Internal ROM – I/O Pins, portsandcircuits–Externalmemory.Counters,TimersandAddressingModes. **(12L)**

UNIT IV

8051 INSTRUCTIONS: Data exchanges – Logical operations – Byte level operation – Bit level logical operations – Rotate and swap operations – Arithmetic operations – Jump and call instructions – Jump and call program range – Jumps – Calls and subroutines – Interrupts andreturn.

(12L)

UNIT V

8051 PROGRAMMING: Assembly Language programming for 8051 Micro controller family – Programs 8–Bit addition – 8–Bit subtraction – 8-Bit Multiplication – 8-Bit Division - Greatest and smallest number in an array – ascending and Descending –Interfacing Keyboard– Interfacing LED, LCD Display– A/D andD/AInterfacing. **(12L)**

(Total:60L)

TEXT BOOKS:

1. Microprocessor and Interfacing: Programming and Hard ware, Douglas V.Hall, McGraw Hill, New York(1988)
2. Microprocessor Architecture Programming and applications with 8085/ 8080A. S.RameshGoankar, Wiley Eastern Limited(1986)
3. Digital systems & Microprocessor Douglas V. Hall, McGraw-Hill.

4. Microprocessor- Srinath, PHILtd.
5. 8051 Micro controller Architecture, Kennath J. Ayala, Programming and Applications, PenramInternational Publishing
6. Microprocessor Principles and Applications – 2nd Edition, Gilmore – Tata McGraw-Hill.

COURSE RESULTS: Students can able to execute microprocessor and microcontroller programs and its applications using assembly language. Able to illustrate how the different peripherals (8255, 8279, 8253, 8237, 8251) are interfaced with microprocessor. able to design, develop and interface complete microcontroller-based systems to peripheral devices using 8051 microcontrollers.

Semester – V / Core -Theory- 6

COMMUNICATION SYSTEMS

LTPC
4 0 0 4

OBJECTIVES:

- This paper deals with the basic concepts of communication systems, transmitter and receiver.
- To understand analog modulation and demodulationtechniques.
- To analyze the adverse effect of noise onsignals.

UNIT I

INTRODUCTION: Communication systems – Modulation - need for modulation- bandwidth-Amplitude modulation - theory- mathematical representation- frequency spectrum - USB & LSB-power relation- Frequency modulation - theory- mathematical representation- frequency spectrum- Phase modulation- comparison of AM- FM-PM. **(12L)**

UNIT II

RADIO TRANSMITTERS: AM transmitter - block diagram - Solid state modulators - circuit explanation- FM transmitter - reactance modulator- varactor diode modulator- Amstrong modulator. **(12L)**

UNIT III

RADIO RECEIVERS: Tuned radio frequency receiver- superheterodyne receiver - block schematic-selectivity-sensitivity-importanceofIF-imagefrequencyrejection-AMreceivers
- schematic explanation - RF amplifiers - circuit explanation - Mixer circuits - IF amplifiers - circuit explanation- simple diode detector - Automatic gain control circuit - simple and delayed AGC - FM receivers - block schematic explanation - amplitude limiting - FM demodulators: slope detectors- phase discriminator-ratiodetectors. **(12L)**

UNIT IV

SIDE BAND COMMUNICATION: Single side band transmission - suppression of carrier - balanced modulator - filtering of unwanted sideband - SSB receivers - block schematic explanation-pilotcarrierreceiver-suppressedcarrierreceiver-Vestigialsidebandtransmission
- Transmitterandreceiverresponses-advantagesofVSBintelevision. **(12L)**

UNIT V

TELEPHONE SYSTEMS: Telephone subscribers loop circuit - subscriber's line interface circuit - Pulse and tone signaling - Frequency assignments - Electronic telephone - block schematic of a telephone set- block schematic of single line analog SLIC board - two wire repeaters - Electronic private automatic branching exchange - basic block schematic- Power line communication:blockschematicexplanation-Facsimile-FAXtransmitterandreceiver**(12L)**

(Total:60L)

TEXT BOOKS:

1. Electronic communication Systems: Wayne Tomasi- PearsonEdn.
2. Electronic communication: Roody and Coolen-PHI.
3. Electronic Communication systems: George Kennedy- Mc GrawHill.

4. Electronic and radio engineering: A PMathur.
5. Telephony and Carrier current engineering: P NDas.
6. Modern communication Systems: Couch-PHI.

COURSE RESULTS: Students can identify the required system for a better communication technique. Analyze and interpret data considering the limitations of various modulation techniques. Employ the appropriate modulators and demodulators for transmitters and receivers.

Semester – V / Core -Theory- 7

IOT (INTERNET OF THINGS) BASED APPLICATIONS

LTPC
4 0 0 4

OBJECTIVES:

- UnderstandthebasicsofIOTandhowitisconnectedtodevicesforanyapplications.
- Acquire knowledge to interface sensors and actuators with microcontroller-based Arduino platform.
- Writing C programs in Arduino Integrated Development Environment(IDE).
- Understand the Communication between microcontroller and PC using serial communication and build the IoT basedapplications.

UNIT I

INTRODUCTION TO INTERNET OF THINGS (IOT): Introduction - Overview of Internet of Things (IoT), the characteristics of devices and applications in IoT ecosystem, building blocks of IoT, Various technologies making up IoT ecosystem, IoT levels, IoT design methodology, The Physical Design/Logical Design of IoT, Functional blocks of IoT and Communication Models, Development Tools usedinIoT. **(12L)**

UNIT II

THINGS AND CONNECTIONS: Working of Controlled Systems, Real-time systems with feedback loop e.g. thermostat in refrigerator, AC, etc. Connectivity models – TCP/IP versus OSI model, different type of modes using wired and wireless methodology, The process flow of an IoT application. **(12L)**

UNIT III

SENSORS AND ACTUATORS: Sensor - Measuring physical quantities in digital world e.g. light sensor, moisture, sensor, temperature sensor, etc. Actuator – moving or controlling system e.g. DC motor, different type of actuators

(12L)

UNIT IV

MICROCONTROLLERS: Controller – Role of microcontroller as gateway to interfacing sensors and actuators, microcontroller vs microprocessor, different type of microcontrollers in embedded ecosystem. **(12L)**

UNIT V

APPLICATIONS OF IOT: Introduction to Arduino IDE – writing code in sketch, compiling-debugging, uploading the file to Arduino board, role of serial monitor. Embedded 'C' Language basics - Interfacing sensors – The working of digital versus analog pins in Arduino platform, interfacing LED, Button, Sensors-DHT, LDR, MQ135, IR. Display the data on Liquid Crystal Display (LCD), interfacing keypad serial communication – interfacing HC-05(Bluetooth module)-Control/handle 220V AC supply – interfacing relaymodule. **(12L)**

(Total:60L)

TEXT AND REFERENCE BOOKS:

1. Macro Schwartz, "Internet of Things with Arduino- Cookbook", Packt2016.

2. ArshdeepBajga and Vijay Madisetti, “Internet of Things- A Hands-on Approach” Universities Press,2014.
3. Massimo Banzi, “Getting started with Arduino”, 2nd Edition, Oreilly, 2011[Make: Makezine.com]
4. Macro Schwartz, “Internet of Things with Arduino”, Open HomeAutomation
5. Michael Margolis, “Arduino Cookbook”, Oreilly,2011

COURSE RESULTS: To equip the students to understand the basics of IoT and its applications. IoT primarily refers to the connected and smarter world having physical and virtual objects with some unique identities. IoT applications span across various domains from agriculture to tech. industry.

Semester – V / Core -Theory- 8

MOBILE COMMUNICATION

LTPC
4 0 0 4

OBJECTIVES:

- To provide the basic foundation of mobile communication and understand the cellular design concepts
- To design a 2G and 3G wireless communication system to meet desired needs within realisticconstraints.
- Understand GSM and CDMA technologies of mobilecommunication.

UNIT I

CELLULAR MOBILE SYSTEM: Introduction to Cellular Mobile System, Performance criteria, uniqueness of mobile radio environment, operation of cellular systems, Hexagonal shaped cells, Analog and Digital Cellular systems, General description of the problem, concept of frequency channels, Co- channel Interference Reduction Factor, desired C/I from a normal case in an omni directional Antenna system, Cell splitting, consideration of the components of Cellular system. **(12L)**

UNIT II

CO-CHANNEL INTERFERENCE: Introduction to Co-Channel Interference, real time Co-Channel interference, Co-Channel measurement, design of Antenna system, Antenna parameters and their effects, diversity receiver, non-co channel interference-different types, Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, constant standard deviation, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long distance propagation antenna height gain, form of a point to point model. **(12L)**

UNIT III

ANTENNAS: Sum and difference patterns and their synthesis, omni directional antennas, directional antennas for interference reduction, space diversity antennas, umbrella pattern antennas, minimum separation of cell site antennas, high gain antennas, Numbering and grouping, setup access and paging channels channel assignments to cell sites and mobile units, channel sharing and borrowing, sectorization, overlaid cells, non-fixed channel assignment, Handoff, dropped calls and cell splitting, types of handoff, handoff invitation, delaying handoff, forced handoff, mobile assigned handoff. Intersystem handoff, cell splitting, micro cells, vehicle locating methods, dropped call rates and their evaluation. **(12L)**

UNIT IV

2 G AND 3 G NETWORKS: Second generation and Third generation Wireless Networks and Standards, WLL, Bluetooth, GSM, IS-95, DECT, GSM architecture, GSM channels, multiplex access scheme,TDMA, CDMA. **(12L)**

UNIT V

INTELLIGENT CELL CONCEPT: Intelligent Cell Concept, Advanced Intelligent Network, SS7 Network and ISDN for AIN, AIN for Mobile communication, Asynchronous Transfer, Mode Technology, Future Public Land Mobile Telecommunication System, Wireless Information Superhighway. **(12L)**

(Total:60L)

TEXT BOOKS:

1. W.C.Y. Lee, “Mobile Cellular Telecommunications”, 2nd Edition, Tata McGraw Hill,2006.
2. Gordon L. Stuber, "Principles of Mobile Communications", 2nd Edition, Springer International,2000.
3. Theodore. S. Rapport, "Wireless Communications", 3rd Edition, Pearson Education,2003.
4. Lee, "Wireless and Mobile Communications", 3rd Edition, McGraw Hill,2006.
5. Jon W. Mark and WeihuaZhqung, "Wireless Communication and Networking", PHI,2005.
6. R. Blake, "Wireless Communication Technology", Thompson Asia Pvt. Ltd.,2004.

COURSE RESULTS: Students could understand the concepts and techniques of mobile, radio communication fundamentals like reflection, diffraction, scattering and fading. Know various multiple access techniques and fundamentals of equalization in wireless communication.

Semester – V / Core -Practical - 5

ADVANDED MICROPROCESSOR LAB

LTPC
0 0 3 2

OBJECTIVES:

- To provide an opportunity to learn and execute assembly language programs for microprocessors andmicrocontrollers

A. MicroprocessorLab

1. Program for 8 Bit Addition andsubtraction
2. Program for16 Bit Addition andsubtraction
3. Program for 8 Bit Multiplication anddivision
4. Program for 16Bit Multiplication anddivision
5. Program for Square and Square root of anumber
6. Program for Sorting andSearching
7. Program for Smallest and Largest number in anarray.
8. Program for Reversing aString
9. Program for Fibonacciseries.
10. Program for Factorial of anumber
11. Program for B.C.D to Binary, Binary to B.C.D, A S C I I toBinary,
12. Binary to ASCIIConversion
13. Six letter worddisplay.
14. Rolling display
15. Interfacing seven segment displays to display anycharacter.
16. Program to display Time (Hours andMinutes)
17. Program for 1's complement and 2's complement of 8 bit and16-bitdata
18. Interfacing Traffic lightcontroller
19. Interfacing Stepper motorcontrol
20. Interfacing Matrix Keyboard
21. InterfacingA.D.C
22. InterfacingD.A.C
23. Study of 8255 chip and generationof
    1. Squarewave
    2. Triangularwave
    3. Saw Toothwave

B. Microcontroller 8051Lab

1. Addition – 8-bit,16bit.
2. Subtraction – 8-bit,16bit.
3. Multiplication 8bit
4. Division8bit
5. Arrayaddition(multibyte)
6. Logical Operations – AND, OR,NOT
7. Decimal to ASCII and ASCII toDecimal.
8. Decimal to Hexa and Hexa toDecimal.
9. AscendingOrder.
10. DescendingOrder
11. Up/downCounter
12. Block datatransfer
13. Interfacing with LCD.
14. Interfacing with MatrixKeypad.
15. Square wavegenerator
16. Interfacing with DC.
17. Interfacing withDAC.
18. DigitalClock.
19. Interfacing with StepperMotor.

COURSE RESULTS: Students can familiarize with assembly-level language programs for microprocessors and microcontrollers

Semester – V / Core -Elective – 1. Select any one (1) or (2)

1. OPTICAL DISPLAYAPPLICATIONS

LTPC
4 0 0 4

OBJECTIVES:

- Acquires the knowledge of optical fabrication technology to various optical display applications

UNIT I

THIN FILM TECHNOLOGY: Thin film deposition techniques thermal/electron beam evaporation, RF/DC sputtering, Ion beam sputtering, pulsed laser beam deposition. Thickness monitoring: Optical and quartz micro-balance techniques monitoring techniques. Display Glasses, Inorganic Semiconductor TFT Technology, Organic TFT Technology, Transparent Conductors, Patterning Processes: Photolithography for Thin Film LCD, Wet Etching, Dry Etching;FlexibleDisplays **(12L)**

UNIT II

OPTICAL TRANSMITTER: Basic concepts, characteristics of semiconductor injection LASER, LED, transmitter design and **OPTICAL RECEIVER:** Basic concepts, p-n and pin photo detectors, Avalanche photo detectors, MSM photo detector, receiver design, receiver noise, receiver sensitivity, optical amplifier and its applications. Photo transistors, solar cells, CCDs, IR andUVdetectors. **(12L)**

UNIT III

OPTICAL SENSORS: Photometry and Radiometry, Radiation Sources and characteristics. Detectors-Imaging and non-imaging (Thermal detectors, Photon detectors, Detector arrays: CCDs, CID, FLIR etc.) and theircharacteristics **(12L)**

UNIT IV

DISPLAY TYPES: Inorganic Phosphors, Cathode Ray Tubes (CRTs), Vacuum Florescent Displays, Filed Emission Displays; Plasma Display Panels, LED Display Panels; Inorganic Electroluminescent Displays: Thin Film Electroluminescent Displays, AC Powder Electroluminescent Displays; Organic Electroluminescent Displays (OLEDs), Liquid Crystal Displays(LCDs) **(12L)**

UNIT V

EMERGING DISPLAYS: Paper like and Low Power Displays: Colorant Transposition Displays, MEMS based displays, 3-D Displays, 3-D Cinema Technology, Autostereoscopic 3-D Technology, Volumetric and 3-D Volumetric Display Technology, Holographic 3-D Technology; Mobile Displays, Energy Aspects of Mobile DisplayTechnology. **(12L)**

(Total:60L)

COURSE RESULTS: This subject helps the students to know about optical applications especially for displays.

TEXT AND REFERENCE BOOKS:

1. Principles of optics, Born and Wolf, SPIE milestone series on-Design of opticalcoatings
2. PracticalDesignandProductionofOpticalThinFilms–SecondEdition–RonaldRonWiley –CRC Press – 2002
3. Fundamentals of Space Systems by Vincent L. Pisacane, Oxford University Press,2005
4. Optical fiber communications- Gerd Keiser-McGraw Hill, 3ed
5. CCD arrays, Cameras & Displays-Gerald C Hoist 1998 [2nd Ed], JCD Publishing-SPIE Optical Eng. Press
6. Janglin Chen, Wayne Cranton, Mark Fihn , "Handbook of Visual Display Technology", SpringerPublication

Semester – V / Core -Elective – 2. Select any one (1) or (2)

2. VLSI (VERY LARGE-SCALE INTEGRATION) TECHNOLOGY

LTPC
4 0 0 4

OBJECTIVES:

- This paper is to study about the MOS Transistor and itscharacteristics.
- To get familiarized with stick diagrams and Layoutdesign.
- To understand the CMOS logic design styles, latches andregisters.
- The students will learn MOSFET, CMOS, and IC Fabrication Process Prerequisite for this paper is basic physics andelectronics.

UNIT I

INTRODUCTION TO MOSFET: Structure of MOSFET: Enhancement mode MOSFET-Depletion Mode MOSFET – MOS Transistor Theory: Figure of merit-MOS Device design equations-equivalent circuits of MOSFETS- Basic structure of CMOS-Solved examples. **(12L)**

UNIT II

BASIC MOS & CMOS AND BIPOLAR LOGIC CIRCUITS: Pass Transistor (or) Transmission gate- Inverters: The nMOS Inverter-MOSFET as a resistance-determination of pull-up to pull-down ratio for an n-MOS inverter by another n- MOS inverter-pull-up to pull-down ratio for an n-MOS inverter driven through one or more pass transistors-Different forms of pull-up-BICMOS Inverter – Tristate Inverter –Differential Inverter-Bipolar logic circuits- DTL- ECL-Integrated injection logic **(12L)**

UNIT III

VLSI FABRICATION PROCESS: Crystal growth and wafer preparation-epitaxy-oxidation-diffusion: Constant source diffusion- limited source diffusion-Parameters affect diffusion-Diffusion Systems- Diffusion Furnace - Ion Implementation- lithography-Dielectric and polysilicon Film Deposition-Etching – Metallization-Yieldandreliability **(12L)**

UNIT IV

FABRICATION OF TYPICAL IC COMPONENTS: Monolithic Resistors-Monolithic Capacitors-Monolithic Diodes-Monolithic Transistors-An overview of MOSFET technology-CMOSTechnology-SolvedExamples **(12L)**

UNIT V

APPLICATION OF CMOS: An Increment/Decrement Circuit-Shift Registers: Left/Right Register- Serial Parallel Registers-Comparators for a two-bit number- Two Phase non- Overlapping clockgenerator **(12L)**

(Total:60L)

TEXT AND REFERENCE BOOKS:

1. Dilip K. Roy, Principles of VLSI, Galgotia Publication Limited,2005
2. Neil H. E. Weste, Principles of CMOS VLSI Design, Addison-Wesley Publishing Company,1993
3. Introduction to VLSI Systems Carver Mead Lynn Conway BS Publication,2003

COURSE RESULTS: Students received a knowledge on MOS transistor structure and its characteristics. Gain knowledge on design rules and layout. Understand CMOS circuit design using the various logic styles.

Semester – V / Core -Mini project

MINI PROJECT

LTPC
0 0 5 2

OBJECTIVES:

1. To develop skills to formulate a technicalproject.
2. To give guidance on the various tasks of the project and standardprocedures.
3. To teach use of new tools, algorithms and techniques required to carry out the projects.
4. To give guidance on the various procedures for validation of the product and analyze the costeffectiveness.
5. To provide guidelines to prepare technical report of theproject.

COURSE RESULTS:

1. Formulate a real-world problem, identify the requirement and develop the design solutions.
2. Identify technical ideas, strategies andmethodologies.
3. Utilize the new tools, algorithms, techniques that contribute to obtain the solution of theproject.
4. Perform test and validate through conformance of the developed prototype and analysis the costeffectiveness.
5. Explain the acquired knowledge through preparation of report and oralpresentations

Mini Project shall be a group activity with a maximum of FIVE students in a group. Students are advised to select topics of their own interest in hardware and develop their hardware skills by designing a circuit of their own. Periodical assessment may be done to evaluate their skills.

Semester – VI / Core -Theory - 9

ANTENNAS

LTPC
4 0 0 4

OBJECTIVES:

- This course is to provide an in-depth understanding of modern antenna concepts and practical antenna design for variousapplications.
- The course will explain the theory of different types of antennas used in communication systems.

UNIT I

FUNDAMENTAL CONCEPTS: Definitions-Radiation Intensity-Directive Gain-Directivity-Power Gain-Beam Width-Gain and Radiation resistance of current element-Half wave Dipole and Folded Dipole-Reciprocity Principle-Effective length and effective area-Radiation Pattern-Fieldzone. **(12L)**

UNIT II

ANTENNA ARRAYS: Introduction, Various forms of Antenna Arrays, Broad side and End Fire Array, Array of Point Sources-Field of two isotropic point sources-Principle of pattern multiplication- Linear arrays of n isotropic point sources- Principle of Log periodic antenna arrays andHelicalantenna. **(12L)**

UNIT III

DESIGN OF ANTENNAS: Long wire, V antenna, Loop antenna, Rhombic antenna, Yagi uda antenna, Horn antenna, Microstrip antenna, ParabolicReflectorantenna. **(12L)**

UNIT IV

ANTENNAS FOR MODERN WIRELESS COMMUNICATIONS: Antennas for Terrestrial mobile communication-Mobile handsets and base stations, Antennas for Satellite Communication-Spiral antenna, Lens antenna,Reconfigurableantenna. **(12L)**

UNIT V

ANTENNA MEASUREMENTS: Impedance (Input) measurement, Radiation measurement, Measurement of Gain, Measurement of antenna efficiency and Directivity, current and phase measurement-Polarizationmeasurement. **(12L)**

(Total:60L)

TEXT BOOKS:

1. Antenna & Wave propagation – K D Prasad. Sathya Prakashan, New Delhi 2004.
2. G.S.N Raju, Antennas and Wave Propagation, Pearson Education, 1st Edition,2006 New Delhi.

COURSE RESULTS: Students can understand the basics concept of antennas, principle, radiation pattern of antenna, design and antenna measurements.

Semester – VI / Core -Theory - 10

OPTICAL FIBER COMMUNICATION

LTPC
4 0 0 4

OBJECTIVES:

- Itprovidesvariousopticalfibermodes,configurations,andvarioussignaldegradationfactors
- Studies about various optical sources and optical detectors and their use in the optical communicationsystem.
- Understandthedifferentkindoflosses,signaldistortioninopticalwaveguidesandother signal degradation factors.
- Learn the various optical source materials, LED structures, quantum efficiency, and laser diodes. Learn the fiber optical receivers such as PIN, APD diodes, noise performance in photo detector, receiver operation andconfiguration.
- Understand the fiber optical network components, variety of networking aspects, Measure various parameters in fibernetworks.

UNIT I

BASIC PRINCIPLES OF OPTICS: Recollection of basic principles of optics: ray theory-reflections at boundary- critical angle- total internal reflection - Optical wave guides - Propagation in fiber- expression for acceptance angle-acceptance cone – numerical aperture- V number - Index profile-effect of index profileonpropagation. **(12L)**

UNIT II

FIBER: SI fiber and GI fiber - Brief description of modes in SI fiber and GI fiber- Pulse dispersion and Band Width limitation- Mode coupling – Attenuation in single mode and multimode fibers-Optic fiber cables- characteristics of cables- Optic fiber couplers: types of coupling – fiber to fiber joints- splicing techniques- opticalfiberconnectors. **(12L)**

UNIT III

OPTICAL SOURCES: Optical sources- LEDs, LASER diodes- operating characteristics- photo-detectors-principles of photo detection – PIN diode – APD – operating principles – photo-multiplier tubes-sourcetofiberpowerlaunching–lensingschemes-modulationcircuits. **(12L)**

UNIT IV

BASIC OPTICAL COMMUNICATION SYSTEMS: Basic optical communication systems-point-to-point link- rise time budget- protection techniques- WDM – transceiver requirements-TDM-opticalamplifiers-SOAs–EDFAs-opticalreceivers-Introductiontoopticalfibernetworks.

(12L)

UNIT V

MEASUREMENTS: OTDR - Measurements- numerical aperture- dispersion measurements-refractive index profile measurements- band width measurements- fiber attenuation measurements-cutoff wave length measurements- applications of fiber optic systems- future developments.

(12L)

(Total:60L)

TEXT AND REFERENCE BOOKS:

1. Fiber optic communication technology: Djafer K Mynbaev, PearsonEducation.
2. Electronic communication: Dennis Roddy & John coolen,PHI.
3. Optic fiber communication: John M senior,PHI.

4. Telecommunication principle circuits Systems and experiments: S.Ramabhadran,Khanna.
5. Optical communication system: John Gower,PHI
6. Fiber opticsintelecommunication: Sharma, Mc GrawHill
7. Optical fiber and fiber optic communication: Subir Kumar Sarkar, S Chand &co. Ltd
8. Optical communication: M Mukund Rao, Universities press.
9. Fiber Optic Communication: Palais, Pearson Education.

COURSE RESULTS: The students could learn the basic elements of optical fiber transmission link, fiber modes, configurations andstructures.

Semester – VI / Core -Theory - 11

ARTIFICIAL INTELLIGENCE

LTPC
4 0 0 4

OBJECTIVES:

- Acquire the knowledge on intelligent agents and problem solving by various search strategies, acquire knowledge on uncertain knowledge representation and various learning techniques.
- Apply planning and reasoning algorithms for solving real lifeproblems

UNIT I

INTELLEGENT AGENTS AND PROBLEM SOLVING: Introduction – Agents and environments, good behavior: The concept of rationality, the nature of environments, the structure of agents, problem solving agents, example of problems, searching for solutions, uninformed search strategies, avoiding repeated states, searching with partialinformation. **(12L)**

UNIT II

SEARCH METHODS: Informed search and exploration: Informed (Heuristic) search strategies, Heuristic functions, local search algorithms and optimization problems, local search in continuous spaces, online search agents and unknown environments, Generic algorithms for TSP. Constraint satisfaction problems: Constraint satisfaction problems, backtracking search for CSPs, Local search for constraint satisfaction problems, structure ofproblems. **(12L)**

UNIT III

PLANNING: Representing actions, situation calculus, classical planning algorithms. The planning problem, planning with state-space search, Partial-order planning, planning graphs, planning with prepositional logic, Analysis of planning approaches. Planning and acting in the real-world time, Schedules and Resources, Hierarchical Task Network Planning, Planning and Acting in Nondeterministic domains, Conditional planning, execution monitoring and replanning, Continuous planning,multi-agentplanning. **(12L)**

UNIT IV

UNCERTAIN KNOWLEDGE AND REASONING: Acting under uncertainty, Basic probability notation, representing knowledge in n uncertain domain, the semantics of Bayeian Networks, efficient representation of conditional distributions, Exact Inference in Bayesian Networks, Approximate Inference in Bayesian Networks, Extending probability to First-order representations, other approaches touncertainreasoning. **(12L)**

UNIT V

LEARNING: Inductive learning for classification, decision-tree induction, neural-networks: representationandtraining **(12L)**

(Total: 60L)

TEXT BOOKS:

1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A modern approach", Pearson publication, 2nd Edition,2002.

2. Jeff Heaton, Artificial Intelligence for Humans – Fundamental Algorithms, Create space Independent Pub; 1st edition,2013.
3. Nils. J. Nilsson, Artificial Intelligence: A New synthesis, Morgan Kaufmann1998.

COURSE RESULTS: Solving the real-life problems

Semester – VI / Core -Theory – 12

COMPUTER NETWORKS

LTPC
4 0 0 4

OBJECTIVES:

- To provide basic knowledge of computer networks, switching, protocol, types of layers software defined networks and theirapplications.
- High reliability and resource sharing is the most importantone.

Unit- I

Data Communications: Components, protocols and standards, Network and Protocol Architecture, Reference Model ISO-OSI, TCP/IP-Overview, topology, transmission mode, digital signals, digital to digital encoding, digital data transmission, DTE-DCE interface, interface standards, modems, cable modem, transmission media- guided and unguided, transmission impairment, performance, wavelengthandShannoncapacity, ReviewofErrorDetectionandCorrectioncodes.(**12L)**

Unit-2

Data Link Layer: Design issues, Data Link Control and Protocols: Flow and Error Control, Stop-and-wait ARQ. Sliding window protocol, Go-Back-N ARQ, Selective Repeat ARQ, HDLC, Point-to –Point Access: PPP Point –to- Point Protocol, PPPStack

Medium Access Sub layer: Channel allocation problem, Controlled Access, Channelization, multiple access protocols, IEEE standard 802.3 & 802.11 for LANS and WLAN, high-speed LANs, Token ring, Token Bus, FDDI based LAN, Network Devices-repeaters, hubs, switches bridges.

(**12L)**

Unit-3

Network Layer: Design issues, Routing algorithms, Congestion control algorithms,

Host to Host Delivery: Internetworking, addressing and routing, IP addressing (class full & Classless),Subnet,NetworkLayerProtocols:ARP,IPV4,ICMP,IPV6,ICMPV6. (**12L)**

Unit-4

Transport Layer: Process to Process Delivery: UDP; TCP, congestion control and Quality of service.

Application Layer: Client Server Model, Socket Interface, Domain Name System (DNS): Electronic Mail (SMTP), file transfer (FTP), HTTP andWWW. (**12L)**

Unit-5

Switching and Software Defined Networks: Circuit switching (space-division, time division and space-time division), packet switching (virtual circuit and Datagram approach), message switching. Software Defined Networking (SDN) – Modern Data Center – Traditional Switch Architecture – Evolution of SDN–SDNoperations. (**12L)**

(Total: 60L)

TEXT AND REFERENCE BOOKS:

1. S. Tannenbum, D. Wetherall, “Computer Networks”, Prentice Hall, Pearson,5thEd.
2. Behrouz A. Forouzan, “Data Communications and Networking”, Tata McGraw-Hill, 4thEd.
3. Larry Peterson Bruce Davie, “Computer Networks: A system Approach”, Fifth Edition, The Morgan Kaufmann Series in Networking- Publisher,2011.
4. Paul Goransson and Chuck Black, “Software Defined Networks: A comprehensive Approach”, First Edition, Morgan Kaufmann,2014.

5. Thomas D. Nadeau, Ken Gray, “SDN: Software Defined Networks”, O‟Reilly Media,2013.

COURSE RESULTS: Students will understand the computer networks and their applications. They will have good knowledge on network applications, performance of computer resource sharing and their workloads.

Semester – VI / Core -Practical - 6

COMMUNICATION SYSTEM AND SYSTEM DESIGN LAB

LTPC

0 0 3 2

OBJECTIVES:

- To provide the practical skills of communication system with the hands-on training on soldering for systemdesign

All experiments must be carried out compulsorily from A and B

A. CommunicationLab

1. Amplitude modulation andDemodulation.
2. Frequency Modulation andDemodulation
3. Pulse Modulation – PAM / PWM /PPM
4. Pulse CodeModulation
5. Delta Modulation, Adaptive Delta modulation.
6. Digital Modulation & Demodulation – ASK, PSK, QPSK,FSK
7. Designing, Assembling and Testing of Pre-Emphasis / De-emphasisCircuits.
8. PLL and Frequency Synthesizer
9. LineCoding
10. Error Control Coding usingMATLAB.
11. Sampling & Time DivisionMultiplexing.
12. Frequency DivisionMultiplexing

B. Electronics Design LabPractical

Students must use dotted boards or Group boards and interconnect the joints by soldering.

Soldering Practice

1. Design and construction of fixed voltage powersupply
2. Design and construction of Dual powersupply
2. Design and construction of switching powersupply
3. Design and construction of 1.5 to 12 V power supply using multi taptransformer.
4. Design and construction of Burglar alarm usingL.D.R
5. Design and construction of Temperature switch usingThermistor
6. Design and construction of Light sensitive switch using Photodiode
7. Design and construction of Audio amplifier using LM380
8. Design and construction of Timercircuit
9. Design and construction of Decade counter/ seven segmentdecoder
10. Design and construction of Logicprobe

COURSE RESULTS: Students are well versed with communication lab skills and the hands-on training of soldering for system design

Semester – VI / Core -Elective – 2 / Select any one (1) or (2)

1. PRINTED CIRCUIT BOARD(PCB)

LTPC

OBJECTIVES: **4 0 04**

- To give a fundamental knowledge of Printed Circuit Board (PCB)s layout planning and design for specialcircuits.

UNIT I

PCB BASICS: Advantages of PCB's – Components of a PCB – PCB Classification – ManufacturingofPCB's.LayoutPlanning:ElectricalDesignConsiderations–ConductorPatterns – ComponentPlacementRules, DesignRulesforAnalogue,DigitalandPowerElectronicCircuits.

(12L)

UNIT II

ARTWORK GENERATION AND IMAGE TRANSFER: Basic Approach to Manual Artwork – Guidelines for Artwork Preparation – Artwork Generation Guidelines. Laminates: Anatomy, Properties and Types. Image Transfer Techniques: Laminate Surface Preparation – Screen Printing – Pattern Transferring Techniques– Printing Process – Photo Printing.

(12L)

UNIT III

PLATING, ETCHING AND MECHANICAL OPERATIONS: Electroplating Process – Plating Techniques – Problems in Plating. Etching Techniques: Etching Solutions and Chemistry – Etching Arrangements – Equipment and Techniques – Etching Problems. Mechanical Operations: Need – Cutting Methods – Hole Punching –Drilling. **(12L)**

UNIT IV

FLEXIBLE PCB'S AND SOLDERING: Construction of Flexible PCB's – Rigid Flex PCB's – Terminations – Advantages – Special Applications. Soldering: Theory – Variables – Materials – Soldering and Brazing – Soldering Tools – Hand Soldering – Mass Soldering – Post Soldering and Cleaning – Rework and RepairofPCB's. **(12L)**

UNIT V

ENVIRONMENTAL CONCERNS: Pollution Control in PCB Industry – Pollution Agents – Recycling of Water – Recovery Techniques – Air Pollution – Recycling of PCB's – Environmental Standards – Safety Precautions – ToxicChemicals. **(12L)**

(Total:60L)

TEXT BOOKS:

1. R S Khandpur - Printed Circuit Boards: Design, Fabrication, Assembly and Testing – McGraw Hill, India –2005
2.Christopher T. Robertson - Printed Circuit Board Designer's Reference: Basics – Prentice International, U.S. –2004
3.PCB Design & Fabrication – Walter.C. Bosshart –TMH

COURSE RESULTS: Students understood about PCB design, manufacturing, characteristics, various types, tests and its application.

Semester – VI / Core -Elective – 2 / Select any one (1) or (2)

2. EMBEDDED SYSTEM AND RTOS

LTPC
4 0 0 4

OBJECTIVES:

- Students must understand the design and development process of embedded systems and their Real Time Operating System(RTOS).
- To know how to integrate embedded hardware, software, and operating systems to meet the functional requirements of embeddedapplications.

UNIT I

INTRODUCTION TO EMBEDDED SYSTEMS: Embedded systems - Application of Embedded Systems - processors in the system - Other Hardware units - software embedded to a system - Exemplar embedded system - Embedded system – on - chip (SOC) and in VLSI circuit. **(12L)**

UNIT II

DEVICES AND BUSES FOR DEVICE NETWORK: I/O Device - timer and counting devices - serial communication using I2C, CAN and USB. Parallel communication using PCI, PCIX and advanced parallelHigh-SpeedBuses. **(12L)**

UNIT III

DRIVERS FOR DEVICE AND INTERRUPTS SERVING MECHANISM: Device drives-parallel port devices drive in a system, serial port Device Drivers in a system, Drivers for internal programmable timing Devices – Interrupt servicing Mechanism – Context and the periods for context switching, Deadline andInterruptLatency. (**12L)**

UNIT IV

EMBEDDED SOFTWARE DELOPMENT USING IDE: Introduction to Integrated development environment (IDE) – programming concepts and embedded programming in Assembly and C – creating a New project – Adding Files to a project – Building a project – Debugging and simulating the application – Getting Embedded software into the Target system. **(12L)**

UNIT V

REAL TIME OPERATING SYSTEM (RTOS): Introduction to basic concepts of RTOS, Basics of real time& embedded system operating systems, RTOS-Interrupt handling, task scheduling; embedded system design issues in system development process-Action plan, use of target system, emulator, use ofsoftwaretools. **(12L)**

(Total:60L)

TEXT BOOKS

1.Rajkamal, "Embedded System-Architecture, Programming, Design", Tata Mc Graw Hill 2006.
2.Daniel W.Lewis "Fundamentals of Embedded Software" Prentice Hall of India, 2004.

REFERENCE BOOKS

1. DavidESimon, AnEmbeddedSoftwarePrimer|personEducationAsia,2006.
2.Frank Vahid, Embedded System Design – A Unified hardware & Software Introduction John Wiley,2002.
3.SriramV.Iyer, Pankaj Gupte, "Embedded Real Time Systems Programming", Tata Mc Graw Hill, 2004.
4.Steve Heath, " Embedded System Design - II edition, Elsevier,2003.
5.Arnold Berger, Embedded System Design: An Introduction to processes, Tools, and Techniques, CMP Books,2001.
6.WayneWolf,Computersascomponents|MorganKaufmannPublishers,2005.
7.Douglas V Hall Microprocessors and Interfacing: Programming and Hardware, Tata McGraw – Hill, Second Edition,2001.

COURSE RESULTS: Students understood about the recent trends of embedded systems and RTOS (its hardware's and software's). Experienced with programming concepts and embedded programming of C andC++.

Semester – VI / Core -Project

PROJECT WORK

LTPC
0 0 7 5

The objective of the project work is to motivate the students for doing research survey and inculcate them to create a self-confidence to work independently. Each student should do an individual project and they can freely choose their own topic of experimental nature. The project should be of a systematic process within the specific duration.

Periodic seminars should be conducted to assess the students. The students should present theprogressoftheprojecttotheirrespectiveguidesandgettherequiredassistancefromthem.

The student will submit their project report in the form of Dissertation which will be examined by the examiners.

The examination shall consist of

I) evaluation of the dissertationand

II) comprehensive viva-voce.

Students are encouraged to take the project work as a challenge so that their project will support their career.