UNIVERSITY OF KERALA

B. TECH. DEGREE COURSE

(2013 SCHEME)

SYLLABUS FOR

V SEMESTER

ELECTRONICS and COMMUNICATION ENGINEERING

SCHEME -2013

V SEMESTER

ELECTRONICS and COMMUNICATION ENGINEERING (T)

Course No	Name of subject	Credits	Weekly load, hours			C A Marks	Exam Duration Hrs	U E Max Marks	Total Marks
			L	T	D/ P				
13.501	Engineering Mathematics IV (AFRT) (Complex Analysis & Linear Algebra)	4	3	1	-	50	3	100	150
13.502	Engineering Management for Electronics Engineers (AT)	3	2	1	-	50	3	100	150
13.503	Microprocessors & Microcontrollers (AT)	4	3	1	-	50	3	100	150
13.504	Electronic Measurements & Instrumentation (T)	3	2	1	-	50	3	100	150
13.505	Applied Electromagnetic Theory (T)	4	3	1	-	50	3	100	150
13.506	Elective I	3	2	1		50	3	100	150
13.507	Communication Engineering Lab (T)	4	-	-	4	50	3	100	150
13.508	Digital Signal Processing Lab (T)	4	-	-	4	50	3	100	150
	Total	**29**	**15**	**6**	**8**	**400**		**800**	**1200**

13. 506 Elective I

13.506.1	Professional Communications (AT)
13.506.2	Fuzzy Systems & Applications (AT)
13.506.3	Artificial Neural Networks (AT)
13.506.4	Bioinformatics (AT)
13.506.5	Mechatronics (AT)
13.506.6	Digital Systems Design with VHDL (T)
13.506.7	Electromagnetic Compatibility (T)

13.501 ENGINEERING MATHEMATICS – IV (AFRT)

(COMPLEX ANALYSIS AND LINEAR ALGEBRA)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits**: 4

Course Objective:

- *To introduce the basic notion in complex analysis such as Analytic Functions, Harmonic functions and their applications in fluid mechanics and differentiations and integration of complex functions ,transformations and their applications in engineering fields*.
- *Many fundamental ideas of Linear Algebra are introduced as a part of this course. Linear transformations provide a dynamic and graphical view of matrix-vector multiplication. Orthogonality plays an important role in computer calculations.*

Module – I

Complex Differentiation: Limits, continuity and differentiation of complex functions. Analytic functions – Cauchy Riemann equations in Cartesian form (proof of necessary part only).Properties of analytic functions – harmonic functions. Milne Thomson method.

Conformal mapping: Conformality and properties of the transformations $w = \frac{1}{z}$, $w = z^2$, $w = z + \frac{1}{z}$, $w = \sin z$, $w = e^z$ - Bilinear transformations.

Module – II

Complex Integration: Line integral – Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – zeros and singularities – residues and residue theorem.

Evaluation of real definite integrals – $\int_0^{2\pi} f(sinx, cosx)dx$, $\int_{-\infty}^{\infty} f(x)dx$ (with no poles on the real axis). (Proof of theorems not required).

Module – III

Vector spaces and subspaces- Null spaces, Column spaces and linear transformations-Kernal and range of a linear transformation -Linearly independent sets-Bases –Bases for nulA and ColA-Co-ordinate systems -Dimension of vector space -Rank -Change of basis.

Module – IV

Inner product spaces -Length and orthogonality -Orthogonal sets-Orthogonal and orthonormal bases -Orthogonal projection -Gram-Schmidt process -Least square problem -Quadratic forms- Constrained optimization of quadratic forms -Singular value decomposition (proof of the theorem are not included).

References:

1. O'Neil P. V., Advanced Engineering Mathematics, Cengage Learning, 2011.
2. Kreyszig E., *Advanced Engineering Mathematics*, 9/e, Wiley India, 2013.
3. Grewal B. S., *Higher Engineering Mathematics*, 13/e, Khanna Publications, 2012.
4. Lay D. C., Linear Algebra with Applications, 3/e, Pearson Education, 2006.
5. Bronson R. and G. B. Costa, Linear Algebra-an introduction, Elsevier Academic Press, 2007.
6. Williams G., Linear Algebra with Applications, Jones and Bartlett Learning, 2012.
7. Strang G., Linear Algebra with Applications, Thomson Learning, 2006.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

After successful completion of this course, the students master the basic concepts of complex analysis and linear algebra which they can use later in their career.

13.502 ENGINEERING MANAGEMENT FOR ELECTRONICS ENGINEERS (AT)

Teaching Scheme: 2(L) - 1(T) - 0(P) **Credits**: 3

Course Objectives:

This paper prepares engineers to fulfil their managerial responsibilities, acquire useful business perspectives and takes on the much needed leadership roles to meet the new challenges.

Module – I

Management challenges to engineers, Functions of engineering management- Brief description of each function . System concept. Types of organization structures - Types of companies and their formation.

Engineers as managers and leaders, Ethics in engineering management, Web based enablers for engineering management, Globalization, Engineering management in the new millennium, Case studies..

Module – II

Personal Management – Objectives and functions – Recruitment, Selection, Training and Induction concepts and Techniques.

Financial Management, Functions of Financial Management, Capital, Sources of Finance- Shares Debentures.

Introduction to Marketing and its Environment- Marketing mix, Product Life Cycle.

Module – III

Cost concept - Break even analysis (simple problems). Depreciation - Methods of calculating depreciation.

Basic concepts quality, Quality Control, Control chart for variables and attributes, TQM, applications, Acceptance sampling, Quality circles.

Module – IV

Reliability, adequate performance of electronic circuits, working specifications, failure density curve, performance of electronic devices, probability indices, frequency indices, duration indices, expectation indices, MTTF MTBF, Reliability of system connected in series and parallel, failure rate calculations, maintainability, replacement.

References:

1. Chang C. M., *Engineering Management*, Pearson, 2012.
2. Gupta A. K., *Engineering Management*, S. Chand, 2010.

3. Chhalotra G. P., *Reliability Methods in Engineering and Its Applications, Khanna Publishers,* 2006.
4. Mahajan M., *Statistical Quality Control*, Dhanpat Rai, 2012.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Note: *Question paper should contain minimum 20% Numerical Problems.*

Course Outcome:

After the completion of this course, students will be familiar with the managerial techniques and shall be confident to take up leadership roles and managerial challenges.

13. 03 MICROPROCESSORS AND MICROCONTROLLERS (AT)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits**: 4

Course Objectives:

- *To understand fundamental operating concepts of microprocessors and microcontrollers.*
- *To appreciate the advantages in using microprocessors and microcontrollers in engineering applications.*
- *To understand low level programming.*
- *To apply this knowledge to more advanced structures*

Module – I

Introduction to microprocessors, 8085 architecture, microprocessor initiated operations and bus organization, internal data operations, external initiated operations, registers, machine cycles and bus timings, memory interfacing, interfacing concepts for I/O devices. 8085 programming model, instruction classification, interrupts, assembly level programming..

Module – II

Introduction to microcontrollers, comparison: microcontrollers and microprocessors, 8051 architecture- memory organization, registers and I/O ports. Addressing modes, instruction sets, and assembly language programming, Introduction to C programming in 8051. Watchdog timer, Power down mode: idle/sleep mode concepts. Interrupts: comparison of interrupt with polling, Interrupt handling and programming. Timer operation: timer modes and assembly level programming.

Module – III

Serial port : modes of operation ,assembly level Programming ,Interfacing to RS232.

Interfacing : keyboard, stepper motor, ADC , DAC, RTC DS 12887 and LCD module interface

Applications - square wave and rectangular wave generation, frequency counter and temperature measurement. Introduction to software development tools: IDE, Cross compiler, cross assembler, builder, Linker, debugger.

Module – IV

Microcontroller RISC family-ARM processor fundamentals: Register Organisation, pipeline, core. ARM instruction sets: data processing, branch, load-store, interrupts & program status register instructions. Exceptions & interrupts: handling & priorities. PIC microcontrollers - introduction, architecture (block diagram explanation only).

References:

1. Gaonkar, *Microprocessor Architecture Programming and Applications with the 8085,* 5/e, Prentice Hall, 2002.
2. Mazidi M. A., *The 8051 Microcontroller and Embedded System*, 2/e, Pearson, 2009.
3. Das L. B., *Embedded systems an Integrated Approach*, Pearson, 2013.
4. Sloss A. N., D. Symes and C. Wright , *ARM system Developer's Guide: Designing and Optimizing System Software*, Elsevier, 2004.
5. PIC 16F877 Data book
6. ARM processor Data book.
7. Ayala K., *The 8051 Microcontroller,* Cengage, 3/e, 2004.
8. Seal D., *ARM Architecture Reference Manual,* Addison Wesley, 2/e, 2000.
9. Wolf W., *Computers as Components: Principles of Embedded Computing system design*, Elsevier, 2005.
10. Kamal R*., Microcontrollers architecture programming interfacing and system design*, Pearson,2/e,2012
11. Kaler R. S*., Text Book of Microprocessors and Microcontrollers*, IK International, 2011.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

***Note:** Question paper should contain 25% Problems and Assembly level Programming. Assembly level Programming only for 8085 & 8051.*

Course Outcome:

After the course student will understand the principle of microprocessor and microcontroller working, programming concepts and applications.

13.504 ELECTRONIC MEASUREMENTS AND INSTRUMENTATION (T)

Teaching Scheme: 2(L) - 1(T) - 0(P) **Credits**: 3

Course Objective:

- *To understand various measurements techniques available.*
- *To understand the errors in measurements.*
- *To understand the basic working of instruments used for measurements.*
- *To study the instruments design techniques.*

Module – I

Introduction, generalized measurement system, static characteristics of instruments, estimation of static errors, dynamic characteristics of instruments, Transducers - classification, Displacement measurements using electrical and optical transducers, strain measurements using stain gauge and fiber optic system, pressure measurement using electrical transducers- piezoelectric, photoelectric methods. Acceleration and force measurements - MEMS accelerometer, strain gauge load cell, piezoelectric load cell, fiber optic load cell.

Module – II

Temperature measurements - thermistors, thermocouple, fiberoptic sensors. Flow measurements-electromagnetic, ultrasonic methods, Level measurements-mechanical, optical and electrical level indicators. Humidity and moisture measurements-capacitive, impedance, piezoelectric, microwave hygrometers, PHmeasurements, density measurements, Signal conditioning, DC and AC bridges-Wheatstone, Kelvin, Maxwell, Schering. PLL, lock in amplifiers.

Module – III

Digital volt meters, digital multimeter, digital frequency meter, Digital RLC meter, Q meter CRO-CRT, waveform display, dual trace and dual beam oscilloscope, oscilloscope probes, specifications, Digital storage oscilloscope, specifications, Signal generators,-function generators, pulse generators, RF signal generators. Frequency synthesizer, Signal analyzers-distortion analyzer, wave analyzer, spectrum analyzer, Network analyzer, logic analyzer.

Module – IV

Instrument design technique, grounding and shielding, concept of earth ground ,grounding errors, grounding considerations, shielding, practical guidelines, protection from electrostatic discharge , elements of design, PLC, circuit layout, assembly and inspection ,testing and calibration, wiring and cabling, enclosures, documentation, Instrumentation in

hazardous area ,protective concepts, enclosure classification designations, intrinsically safe design, Indian standards.

References:

1. Ghosh A. K., *Introduction to Measurements and Instrumentation*, PHI, 4/e, 2013.
2. Bell D. A., *Electronic Instrumentation and Measurements*, PHI, 2012.
3. Anand M. M. S*., Electronic Instruments and Instrumentation Technology,* PHI, 2013.
4. Dally J.W., W. Riley and K. G. McConnell, *Instrumentation for Engineering Measurements*, 2/e, Wiley India, 2012.
5. Carr J. J., *Elements of Electronic Instrumentation and Measurements,* Pearson, 3/e, 2013.
6. Kishore K. L*., Electronic Measurements and Instrumentation*, Pearson, 2009.
7. Witte R. A., *Electronic Test Instruments*, Pearson, 2/e, 2006.
8. Nagabhushana S. and N. Sathyanarayana, *Laser and Optical Instrumentation*, I K International Publishing House, 2010.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

***Note:** Question paper should contain minimum 20% Numerical Problems.*

Course Outcome:

After the course the student will be able to explain the working of various electronic instruments and the design aspects.

13.505 APPLIED ELECTROMAGNETIC THEORY (T)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits:** 4

Course Objectives:

- *To impart knowledge on the basic concepts of electric and magnetic fields.*
- *To educate scientifically about Maxwell equations and Poynting theorem.*
- *To become familiar with propagation of signal through transmission lines and waveguides.*

Module – I

Review of vector calculus, spherical and cylindrical coordinate system, elemental displacement, area and volume for spherical and cylindrical coordinate system. Curl, Divergence, Gradient in spherical and cylindrical coordinate system. Electric field – Coulomb's law, Stokes theorem, Gauss law and amperes current law. Poisson and Laplace equations, Determination of E and V using Laplace equation. Derivation of capacitance and inductance of two wire transmission line and coaxial cable. Energy stored in Electric and Magnetic field.

Module – II

Displacement current density, continuity equation. Magnetic vector potential. Relation between scalar potential and vector potential. Maxwell's equation from fundamental laws. Boundary condition of electric field and magnetic field from Maxwell's equations. Solution of wave equation, propagation of plane EM wave in perfect dielectric, lossy medium, good conductor media-attenuation, phase velocity, group velocity, skin depth.

Reflection and refraction of plane electromagnetic waves at boundaries for normal & oblique incidence (parallel and perpendicular polarization)– Snell's law of refraction, Brewster angle.

Module – III

Power density of EM wave, Poynting vector theorem, Complex Poynting vector. Polarization of electromagnetic wave-linear, circular and elliptical polarisation. Uniform lossless transmission line - line parameters, transmission line equations, Voltage and Current distribution of a line terminated with load , Reflection coefficient and VSWR. Derivation of input impedance of transmission line. Transmission line as circuit elements (L and C). Half wave and quarter wave transmission lines.

Module – IV

Development of Smith chart - calculation of line impedance and VSWR using smith chart. Single stub matching (Smith chart and analytical method). Parallel-Plate Waveguide - TE & TM waves. The hollow rectangular wave guide – modes of propagation of wave- dominant

mode, group velocity and phase velocity. Attenuation in wave guides, guide wavelength and impedance.

References:

1. Sadiku M. N. O., *Elements of Electromagnetics,* 5/e, Oxford University Press, 2010.
2. Edminister J. A*., Electromagnetics*, 2/e, Schaum's Outline Series McGraw Hill, 1995.
3. Inan U. S. and A. S. Inan*, Engineering Electromagnetics*, Pearson, 2010.
4. Hayt W. H., *Engineering Electromagnetics*, 7/e, McGraw Hill, 1994.
5. Rao N. N., *Elements of Engineering Electromagnetics*, 6/e, Pearson, 2006.
6. Raju G. S. N., *Eletromagnetic Field Theory and Transmission Lines,* Pearson, 2005.
7. Kraus J. D., *Electromagnetics*, 5/e, TMH, 2010.
8. Plonus M. A., *Applied Electromagnetics,* McGraw Hill, 2/e, 1978.
9. Cheng D. K., *Field and Wave Electromagnetics*, Pearson, 2/e, 2013.
10. Jordan E. C. and K. G. Balmain, *Electromagnetic waves and Radiating Systems*, 2/e, PHI, 2013.
11. Ulaby F. T, *Fundamentals of Applied Electromagnetics*, 6/e, Pearson, 2009.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

***Note:** Question paper should contain minimum 50% and maximum 70% Analysis and Problems.*

Course Outcome:

After completion of the course the student will understand the basic concepts of electromagnetic theory and signal transmission through wave guide and transmission lines

13.506.1 PROFESSIONAL COMMUNICATION (AT)

Teaching Scheme: 2(L) - 1(T) - 0(P) **Credits**: 3

Course Objective:

- *To understand the concepts and acquire necessary communication skills*
- *To shape personalities and to deal with global business and life situations*
- *To study the topics relating to technology, legal and ethical aspects of business, employment interview*

Module – I

Introduction to communication, meaning and definition, features, significance, forms of communication, channels, models-Shannon's, Shannon- Weaver, transactional, limitations, barriers to communication, oral communication, significance, types, business presentation, features, types, steps, visual aids in communication, listening, written communication, merits and demerits, reports, significance, types, components of a report, report writing process.

Module – II

Proposals, types of proposals, external and internal proposal, qualities of a good proposal, steps in proposals, technical documents, thesis, features, scientific article and research paper, dissertation, business letters, types, components, forms, layout, government letters, components, memorandum, components, format of a memo, guidelines, nonverbal communication, features, functions, nonverbal leakage, stimuli, mass media communication, significance, categories, public relations management, tools of public relations, press conference, press release.

Module – III

Meetings, types, virtual mode of meeting, notice, agenda, conduct of meetings, chairpersons role, members role, minutes of meeting, cross cultural and global communication, characteristics, Hofstede's model, barriers, effective global communication, communication and information technology, impact of ICT, E-business, E- business related operations, E-mail, videoconferencing, writing employment messages, adapting to workplace change, writing resumes, writing job application letters.

Module – IV

Employment interviews, role of communication in the interview process, types of interviews, characteristics, qualities of a interviewer, success in interview process.

Legal issues in professional communication, ethics in business communication, significance, ethics related issues, corporate communication, business etiquettes,

significance, etiquette rules, verbal and nonverbal etiquette, visits, gifts, E-mail etiquette, meeting etiquette, dining etiquette.

Practical (**No University Examination)**

Practice in speech making process, developing communicative ability, techniques for speaking fluently, using body language, developing fluency and confidence, short speeches, group discussions and role-plays, listening activities, effective presentation strategies, writing user manuals for electronic equipment

References:-

1. SubbaRao P., B. Anita Kumar, C.H. Bindu**,** *Business Communication,* Cengage, 2012.
2. KavithaTyagi and Padma Mishra*, Professional Communication,* PHI, 2011.
3. KavithaTyagi and Padma Mishra*, advanced Technical Communication,* PHI, 2011.
4. Tyagi, *Advanced Technical Communication*, PHI, 2013.
5. Bert Decker, *The Art of Communicating*, Crisp Publication, 2004.
6. Meenakshi Raman and Sangeeta Sharma, *Technical Communication,* Oxford University Press, 3/e, 2004.
7. Anderson P., *Technical Communication*, Cengage, 8/e, 2014.
8. Rajendra Pal, *Essentials of Business Communication*, Sultan Chand, 11/e, 2009.
9. Madhukar, *Business Communications*, VIKAS, 2/e, 2013.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

After the course ,the student will be able to understand the topics relating to technology and ethical aspects of business, employment messages, employment interview, basic concepts of communication skills, mass media communication etc.

13.506.2 FUZZY SYSTEMS AND APPLICATIONS (AT)

Teaching Scheme: 2(L) - 1(T) - 0(P) **Credits:** 3

Course Objectives:

- *To understand the concepts and terminologies of fuzzy systems.*
- *To study the concepts of crisp sets, fuzzy sets and fuzzy networks.*
- *To study various applications of fuzzy systems.*

Module – I

Introduction to fuzzy sets and systems-crispness, vagueness, uncertainty and fuzziness. Basics of fuzzy sets, membership functions, support of a fuzzy set height, normalized fuzzy set, alpha cuts.

Type- 2 fuzzy sets. Operation on fuzzy set-complement, intersection, union, Demorgan's Law Equality & subset hood. Law of excluded middle and contradiction, concentration, dilation, contrast intensification.

Module – II

Extension Principle and its application. Fuzzy relation- operations, projection, max-min , min-max composition, cylindrical extension. Reflexivity, symmetry and transitivity of fuzzy relations. Fuzzy prepositions, fuzzy connectives, linguistic variables, hedges, Approximate reasoning or fuzzy inference, Fuzzy rule based system. Fuzzification and defuzzification using centroid, centre of sums.

Module – III

Applications-Fuzzy logic controllers, Types of FLC- Types of Fuzzy rule formats. Block diagram of fuzzy logic controller. Multi input multi output control system. FLC with different case studies. PID controller. Air Conditioner controller using Fuzzy logic.

Module – IV

Introduction to Neural Fuzzy Controller- Neural Fuzzy controller with hybrid structure, Parameter learning for Neural fuzzy controllers – Neural Fuzzy controller with Fuzzy singleton Rules. Introduction to ANFIS- Structure of an ANFIS – Neural Fuzzy controller with TSK fuzzy rules.

References:

1. Ross T. J., *Fuzzy Logic with Engineering Applications*, Wiley, 3/e, 2010.
2. Lin C. T. and C.S. G. Lee, *Neural Fuzzy Systems*, Prentice Hall, 1996.
3. Ibrahim A. M., *Introduction to Applied Fuzzy Electronics*, PHI, 2013.
4. Rajasekaran and Pai, *Neural Networks Fuzzy Logic and Genetic Algorithms*, PHI, 2003.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

After the course the student will be able to know the concepts of fuzzy system and applications.

13.506.3 ARTIFICIAL NEURAL NETWORKS (AT)

Teaching Scheme: 2(L) - 1(T) - 0(P) **Credits:** 3

Course Objectives:

- *To learn concepts of Artificial neural networks.*
- *To learn various architecture of ANN*
- *To study the methods of operating informations in ANN.*

Module – I

Introduction to Neural Networks - Applications - Typical architecture of Artificial Neural Networks - Common activation function, Mc. Culloh Pitts Neuron – Architecture, logic implementatons. Supervised and Unsupervised learning- Learning Algorithms .Linear Separability -Pattern Classification – Hebb Net, Perceptrons, ADALINE networks (Architecture, Algorithm and simple Applications).

Module – II

Pattern Association- training algorithms- Hetro Associative Network, Auto Associative Network, Hopfield Network, BAM Network. Self organizing Maps - Learning Vector Quantization (Architecture, Algorithm and Applications.

Module – III

Counter Propagation Network (Architecture, Algorithm and Applications). Conjugate Gradient Learning- Back Propagation algorithm-Multilayer feed forward network (Architecture, Algorithm and applications).

Module – IV

Adaptive Resonance Theory- ART 1 and ART 2. Cover's theorem- Radial Basis Function Networks. Boltzmann machine (Architecture, Algorithms and Applications). Introduction to Probabilistic neural network.

References:

1. Fausett L., *Fundamentals of Neural Networks,* Pearson Education. 2004.
2. Haykin S., *Neural Networks,* PHI, 3/e, 2012.
3. Freeman J. A. and D. M. Skapura, *Neural Networks - Algorithms, Applications and Programming Techniques,* Pearson Education, 2008.
4. Bose N. K. and P. Liang, *Neural Network Fundamentals with Graphs, Algorithms and Applications,* McGraw Hill, 1996.
5. Hagan M. T., H. B. Demuth and M. Beale*, Neural Network Design,* Vikas Thomson Learning, 1996.

6. Sivanandham, Sumathi, Deepa, *Introduction to Neural Networks using MATLAB,* TMH, 2005.
7. Bishop C. M., *Neural Networks for Pattern Recognition,* Oxford University Press, 1995.
8. Yegnanarayana*, Artificial Neural Networks*, PHI, 2012.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

***Note:** Question paper should contain minimum 70% Problems and Algorithm.*

Course Outcome:

After successful completion of the course, students will be familiar with the concept of ANN and will be able to apply the right algorithm to solve practical problems.

13.506.4 BIOINFORMATICS (AT)

Teaching Scheme: 2(L) - 1(T) - 0(P) **Credits:** 3

Course Objectives:

- *To familarise terminology used in bioinformatics*
- *To give an understanding of bioinformatics and algorithms, data bases and matrices, alignment and comparison, sequences, and algorithms to analyse data*
- *To study the applications of bioinformatics*

Module – I

The cell as basic unit of life-Prokaryotic cell and Eukaryotic cell - Central Dogma: DNA-RNA-Protein, Introduction to DNA and Protein sequencing, Human Genome Project, SNP, Bioinformatics databases- Nucleotide sequence databases, Primary nucleotide sequence databases-EMBL, Gene Bank, DDBJ; Secondary nucleotide sequence databases Protein sequence databases- Swiss Prot. Protein Data Bank.

Module – II

Basic concepts of sequence similarity, identity and homology, definitions of homologues, orthologues, paralogues. Scoring matrices- PAM and BLOSUM matrices, Pairwise sequence alignments: Needleman & Wuncsh, Smith & Waterman algorithms for pairwise alignments. BLAST and FASTA. Multiple sequence alignments (MSA)- CLUSTALW. Basic concepts of phylogeny- Phylogenetic analysis algorithms - Maximum Parsimony, UPGMA and Neighbour-Joining. Evaluation of phylogenetic trees-reliability and significance; Boot strapping; Jackknifing.

Module – III

Computational approaches for bio-sequence analysis - Mapping bio-sequences to digital signals – various approaches – indicator sequences – distance signals – use of clustering to reduce symbols in amino acid sequences – use of cross correlation to locate desired patterns in nucleotide sequences- Chaos Game Representation of Genomes- analysis of bio-sequence signals: case study of spectral analysis for exon location.

Module – IV

Systems Biology: System Concept- Properties of Biological systems, Self organization, emergence, chaos in dynamical systems, linear stability, bifurcation analysis, limit cycles, attractors, stochastic and deterministic processes, continuous and discrete systems, modularity and abstraction, feedback, control analysis, Mathematical modeling; Biological Networks- Signaling pathway, GRN, PPIN, Flux Balance Analysis, Systems biology v/s synthetic biology.

References:

1. Claverie J. M. And C. Notredame, *Bioinformatics - A Beginners Guide*, Wiley-Dreamtech India Pvt, 2003.
2. Alon U., *An Introduction to Systems Biology Design Principles of Biological Circuits*, Chapman & Hall/CRC, 2006.
3. Zvelebil M. J. and J. O. Baum, *Understanding Bioinformatics*, Garland Science, 2008.
4. Bergeron B.P., *Bioinformatics Computing,* Pearson Education, 2003.
5. Mount D.W., *Bioinformatics: Sequence & Genome Analysis*, Cold Spring Harbor Press, New York, 2004.
6. Semple C., R. A. Caplan and M. Steel, *Phylogenetics,* Oxford University Press, 2003.
7. Orengo C. A., D. T. Jones and J. M. Thornton*, Bioinformatics- Genes, Proteins and Computers,* Taylor & Francis 2003.
8. Singh R. and R. Sharma, *Bioinformatics*, Universities Press, 2010.
9. Resources at web sites of NCBI, EBI, SANGER, PDB etc.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

***Note:** Question paper should contain minimum 40% to 60% quantitative questions.*

Course Outcome:

After successful completion of the course, student will be able to understand the basic principles bioinformatics, algorithms and application.

13.506.5 MECHATRONICS (AT)

Teaching Scheme: 2(L) - 1(T) - 0(P) **Credits:** 3

Course Objectives:

This course provides students an introduction to mechatronics and provides an insight on systems, system devices, Direct Numerical Control and Computer aided planning.

Module – I

Introduction to mechatronics - What is mechatronics - design process – systems - measurement systems - control systems - programmable logic controllers - examples of mechatronic systems - fundamentals of numerical control - advantages of NC systems - classification of NC systems - point to point and contouring systems - NC and CNC - incremental and absolute systems - open loop and closed loop systems - features of NC machine tools - fundamentals of machining.

Module – II

System devices - system drives - hydraulic systems - DC motors - stepping motors - AC motors -feedback devices - encoders - pulse digitizers - resolvers - tachometers - counting devices - flip flops - counters - decoders - digital to analog converters - interpolation - linear interpolator - circular interpolators Complete interpolator - Control Loops for CNC - CNC software interpolator.

Module – III

Direct Numerical Control (DNC)-Distributive Numerical Control- DNC configurations-connecting NC/CNC machines to DNC systems-DNC system hardware components- DNC software- DNC selection criteria-Computer Integrated Manufacturing (CIM) Introduction-Automated Storage and Retrieval Systems.

Module – IV

Computer Aided Process Planning - Material Requirement Planning - Computer Aided Inspection - Machine Vision NC part programming - manual programming - concepts - tape formats - tab sequential - fixed block word address and variable block formats - part programming examples - point to point programming and simple contour programming - computer aided programming - concepts - APT programming - part programming examples.

References:

1. Koren Y., *Computer Control of Manufacturing Systems,* McGraw Hill, 1983.
2. HMT, *Mechatronics*, TMH, 2000.

3. Groover M. P., M. Weiss, R. N. Nagel and N. G. Odrey, *Industrial Robots - Technology, Programming and Applications*, McGraw Hill, 1986.
4. Groover M. P. and E. W. Zimmers, *CAD/CAM: Computer Aided Design and Manufacturing*, Prentice Hall, 1984.
5. Koren Y. and B. Yuri, *Numerical Control of Machine Tools*, Khanna Publishers, 1984.
6. Bolton W., *Mechatronics: A Multidisciplinary Approach,* 4/e, Pearson Education, 2008.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

After the completion of this course, students will be familiarized with mechatronics concepts, design process, systems, system devices and Direct Numerical Control systems. Students will also be equipped with good knowledge on Computer aided programing.

13.506.6 DIGITAL SYSTEMS DESIGN WITH VHDL (T)

Teaching Scheme: 2(L) - 1(T) - 0(P) **Credits:** 3

Course Objectives:

- *To learn the design of digital circuits of practical systems*
- *To understand standard design procedure for digital circuits at a higher level language*

Module – I

Introduction to VHDL, Identifiers, data objects, Data types, and operators in VHDL. Entity declaration. Architecture modeling - structural, behavioural & data flow. Constant, signal, aliases, and variable assignments. Conditional statements – *if then else, when else*, with select and case statements. Loop statements - for, while, loop and generate statements. exit, next, block, assertion and report statements. Generics. Configurations - specification & declaration, conversion functions, direct instantiation.

Module – II

Subprograms - functions and procedures, operator overloading. Packages - package declaration, package body. Attributes - user defined and predefined. Delay modeling - delta delay, transport delay, inertial delay, wait statement. Test bench generation - waveform generation, text I/O.

Module – III

VHDL description of combinational building blocks - binary decoders, binary encoders , priority encoder, multiplexers , demultiplexers, comparators, parity detector, adders. Synchronous sequential systems - models of Synchronous sequential systems, state machines in VHDL. VHDL description of sequential logic blocks - Latches & Flip Flops, Registers, Counters, Memory, Sequential multipliers.

Module – IV

VHDL simulation - event driven simulation, Simulation of VHDL models , Simulation modelling issues, VHDL synthesis - RTL synthesis, Constraints, Behavioural synthesis, Verifying synthesis results. Introduction to FPGA & CPLD, designing with FPGA & CPLD, Xilinx 4000 Series FPGAs and Altera Flex 10K series CPLDs.

References:

1. Zwolinski M., *Digital systems design with VHDL*, Pearson Education Limited, 2/e, 2004.
2. Bhasker J.*, A VHDL Primer,* Pearson, 3/e, 2004.

3. Roth C. H., *Digital System Design Using VHDL*, Cengage, 2008.
4. Pedroni V. A*., Circuit design with VHDL*, PHI, 2008.
5. Perry D. L., *VHDL Programming by Example*, TMH, 4/e, 2008.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

***Note:** Question paper should contain minimum 60% Design and Programs.*

Course Outcome:

After successful completion of the course, students will be able to design various practical electronic systems.

13.506.7 ELECTROMAGNETIC COMPATIBILITY (T)

Teaching Scheme: 2(L) - 1(T) - 0(P) **Credits:** 3

Course Objectives:

- *To study Electromagnetic interference fundamentals and EMI sources.*
- *To learn EMI measuring instruments and their uses.*
- *To study EMI standards and controlling methods.*

Module – I

Introduction to Electro-magnetic Interference (EMI) - Definitions, Different Sources of EMI, Electro-static discharge (ESD), Electro-magnetic pulse (EMP), Lightning, Mechanism of transferring Electro-magnetic Energy: Radiated emission, radiated susceptibility, conducted emission, conducted susceptibility, Differential & common mode currents. Introduction to EMC - Concepts of EMC, EMC units. EMC requirements for electronic systems - World regulatory bodies- FCC, CISPR etc. Class-A devices, class-B devices.

Module – II

Different Mitigation Techniques for preventing EMI. Grounding: Fundamental grounding concepts, Floating ground, Single-point & Multi-point ground, advantages & disadvantages of different grounding processes. Shielding: Basic concepts of shielding, Different types of shielding, Shielding effectiveness(S.E), S.E of a conducting barrier to a normal incident plane wave, multiple reflection within a shield, mechanism of attenuation provided by shield, shielding against magnetic field & Electric field, S.E for Electronic metal & Magnetic metal, Skin-depth, S.E for far-field sources, shield seams.

Cross-talks & Coupling, Measurement set for measuring Cross-talk. Filtering & decoupling.

Non-ideal behaviour of different electronic components - Examples: Communication equipment, Microwave oven, Personal Computers, Health Hazards limits, EMC in healthcare environment.

Module – III

Antennas - Characteristics of antennas, fields due to short electric dipole & small magnetic pole, near field & Far-field sources & their characteristics. Broadband antenna measurements, antenna factor.

Time-domain & Frequency-domain Analysis of Different Signals - identifying the frequency, phase & power spectrum of different signals. Time-domain Reflectrometry (TDR) basics for determining the properties of a transmission line. System Design For EMC - Simple susceptibility models for wires & PCB, Simplified lumped model of the pick-up of incident field for a very short two-conductor line.

Cables, connectors, components: EMI suppression cables, EMC connectors, EMC gaskets, Isolation transformers, optoisolators. Choice of capacitors, inductors, transformers and resistors.

Module – IV

Digital and Analogue circuit design : Design for emission control and design for immunity, Radiation from logic circuits, analogue circuits and SMPS. Microprocessor watchdog, defensive programming.

Radiated and conducted interference measurements and ESD : Anechoic chamber, TEM cell, GH TEM Cell, characterization of conduction currents / voltages, conducted EM noise on power lines, conducted EMI from equipment, Immunity to conducted EMI detectors and measurements. ESD, Electrical fast transients / bursts, electrical surges. Measurements of radiated emission in open test range & in Anechoic chamber, Conducted emission testing by Line Impedance Stabilization network (LISN).

References:

1. Kodali P., *Engineering Electromagnetic Compatibility*, S. Chand, 2000.
2. Williams T., *EMC for Product Designers*, B-H Newnes, Oxford.
3. Tesche F. M, M. V. Ianoz and T. Karlsson, *EMC Analysis Methods & Computational Models*, John Wiley, 1997.
4. Paul C. R., *Introduction to Electromagnetic compatibility*, John Wiley, 2006.
5. Archambeault B. R., O. M. Ramahi and C. Brench, *EMI/EMC Computational modeling Handbook*, Springer, 2013.
6. Sengupta D. L. and V. V. Liepa, *Applied Electromagnetics and Electromagnetic Compatibility*, John Wiley, 2005.
7. Keiser B., *Principles of Electromagnetic Compatibility*, 3/e, Artech House, 1986.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

***Note:** Question paper should contain minimum 40% and maximum 60% Design, Analysis and Problems.*

Course Outcome:

After successful completion of the course,

- *Students will be acquainted with the basic concepts of EMI and standards.*
- *Student will be able to design electronic instruments considering EMI standards.*

13.507 COMMUNICATION ENGINEERING LAB (T)

Teaching Scheme: 0(L) - 0(T) - 4(P) **Credits**: 4

Course Objective :

- *To practise the basic theories of analog communication*
- *To study different IC and applications in communication*

List of Experiments:

1. AM generation using discrete components.
2. AM using multiplier IC AD534 or AD633.
3. AM detection using envelope detector.
4. IF tuned amplifier.
5. FM using 555 IC.
6. Study of PLL IC- Measurement of lock and capture range.
7. FM generation and demodulation using PLL.
8. Pre-emphasis and de-emphasis circuits
9. Frequency multiplier using PLL.
10. PAM modulator and demodulator
11. PWM Modulation & Demodulation using 555 timer
12. PPM Modulation & Demodulation using 555 timer.

Internal Continuous Assessment *(Maximum Marks-50)*

40% - Test
40% - Class work and Record
20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

Questions based on experiments prescribed in the list.

25% - Circuit Design

15% - Performance (Wiring, use of equipment/instruments and trouble shooting)

35% - Result

25% - Viva voce

Candidate shall submit the certified fair record for endorsement by the external examiner.

Course Outcome:

From the practical exposure, the students will be able to design communication circuits.

13.508 DIGITAL SIGNAL PROCESSING LAB (T)

Teaching Scheme: 0(L) - 0(T) - 4(P) **Credits**: 4

Course Objective :

- *To study the basics of signal processing techniques and filter design using DSP*
- *To study the basics of MATLAB and design circuits*

List of Experiments:

Part A: Experiments on Digital Signal Processors:

1. Generation of sine wave.
2. Generation of standard test signals.
3. Convolution : Linear and Circular
4. Real Time FIR Filter implementation (Low-pass, High-pass and Band-pass)
5. Real Time IIR Filter implementation (Low-pass, High-pass and Band-pass)
6. Sampling of analog signal and study of aliasing.

Part B: Experiments using MATLAB

1. Convolution: Linear Convolution, Circular Convolution, Linear Convolution using Circular Convolution.
2. Random Sequence Generation: Uniform, Rayleigh and Normal Distributions.
3. Discrete Fourier Transform: (Unfolding the spectrum, Frequency Unwrapping).
4. Linear convolution using DFT (Overlap-add and Overlap-Save methods).
5. Design & implementation of IIR filters from analog specifications. (Butterworth and Chebyshev Filters).
6. Design & implementation of FIR filters from analog specifications. (Window method).
7. Familirization of Filter design tool box.
8. Generation of AM, FM & PWM waveforms and their spectrum.
9. Study of sampling rate conversion by a rational factor..

Internal Continuous Assessment *(Maximum Marks-50)*

40% - Test
40% - Class work and Record
20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

Questions for each batch should be based on the list of experiments prescribed, equally from Part A and Part B.

25% - Circuit Design (Logical design and flow diagram for software experiments)

15% - Implementation (Usage of Kits and trouble shooting, Coding for Software experiments)

35% - Result (Including debugging of Program for software experiments)

25% - Viva voce

Candidate shall submit the certified fair record for endorsement by the external examiner.

Course Outcome:

After completion the course student will be able to design circuits using DSP techniques and MATLAB.