E.G.S. PILLAY ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai

Accredited by NAAC with 'A' Grade | Accredited by NBA (CSE, EEE, MECH)

NAGAPATTINAM – 611 002

M.E. COMMUNICATION SYSTEMS

Full Time Curriculum and Syllabus

Second Year – Third Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1702CO301	Electromagnetic Interference and Compatibility in System Design	2	2	0	3	40	60	100
1703CO024	**Elective IV -** Machine Learning Algorithms	3	0	0	3	40	60	100
1703CP017	**Elective V -** Embedded Software Development	3	0	0	3	40	60	100
Laboratory Course								
1704CO302	Project Work Phase-I	0	0	12	6	50	50	100
Open Electives								
1703CO033	Wireless Sensor Networks	3	0	0	3	40	60	100
1703CO034	Optical Signal Processing	3	0	0	3	40	60	100
1703CO035	High Speed Switching Architecture	3	0	0	3	40	60	100
1703CO036	Network Engineering And Management	3	0	0	3	40	60	100

L – Lecture | T – Tutorial | P – Practical | C – Credit | CA – Continuous Assessment | ES – End Semester

1702CO301	ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY IN SYSTEM DESIGN	L	T	P	C
		3	0	0	3

PREREQUISITE :
1. Antenna and Wave propagation
2. Electromagnetic Fields

COURSE OBJECTIVES:
1. To explore the concepts of EMI Environment and EMI Coupling Principles
2. To focus on popular EMI/EMC Standards and Measurements
3. To study the control techniques involved in Electromagnetic Interference

UNIT I EMI ENVIRONMENT — 9 Hours

EMI/EMC concepts and definitions, Sources of EMI, conducted and radiated EMI, Transient EMI, Time domain Vs Frequency domain EMI, Units of measurement parameters, Emission and immunity concepts, ESD.

UNIT II EMI COUPLING PRINCIPLES — 9 Hours

Conducted, Radiated and Transient Coupling, Common Impedance Ground Coupling, Radiated Common Mode and Ground Loop Coupling, Radiated Differential Mode Coupling, Near Field Cable to Cable Coupling, Power Mains and Power Supply coupling.

UNIT III EMI/EMC STANDARDS AND MEASUREMENTS — 9 Hours

Civilian standards - FCC, CISPR, IEC, EN, Military standards - MIL STD 461D/462, EMI Test Instruments /Systems, EMI Shielded Chamber, Open Area Test Site, Military Test Method and Procedures (462).

UNIT IV EMI CONTROL TECHNIQUES — 9 Hours

Shielding, Filtering, Grounding, Bonding, Isolation Transformer, Transient Suppressors, Cable Routing, Signal Control, Component Selection and Mounting.

UNIT V EMC DESIGN OF PCBS — 9 Hours

PCB Traces Cross Talk, Impedance Control, Power Distribution Decoupling, Zoning, Motherboard Designs and Propagation Delay Performance Models, Electrical, Magnetic and Thermal analysis of circuits for EMC.

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :
1. TEM Cell.
2. Sensors/Injectors/Couplers.
3. Test beds for ESD and EFT.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

- CO1 Recall electromagnetic concepts and its measuring parameters.
- CO2 Uunderstand the EMI coupling principle and its types.
- CO3 Know the design and architecture of Micro machined Antennas.
- CO4 Explain Mems phase shifters and its applications.
- CO5 Demonstrate Designing of PCBs.

REFERENCES:
1. Henry W.Ott, Noise Reduction Techniques in Electronic System, John Wiley and Sons, 2008
2. C.R. Paul, Introduction to Electromagnetic Compatibility, John Wiley and Sons, Inc, 2005
3. V.P.Kodali., Engineering EMC Principles, Measurements and Technologies, IEEE Press, 1996
4. Bernhard Keiser, Principles of Electromagnetic Compatibility, Artech house, 1986

1703CO024	MACHINE LEARNING ALGORITHMS	L	T	P	C
		3	0	0	3

PREREQUISITE :

1. Soft Computing
2. Robotics and Automation

COURSE OBJECTIVES:

1. To understand the concepts of machine learning
2. To appreciate supervised and unsupervised learning and their applications
3. To understand the theoretical and practical aspects of Probabilistic Graphical Models
4. To appreciate the concepts and algorithms of reinforcement learning
5. To learn aspects of computational learning theory

UNIT I INTRODUCTION 9 Hours

Machine Learning -Machine Learning Foundations –Overview –Design of a Learning system -Types of machine learning –Applications Mathematical foundations of machine learning -random variables and probabilities -Probability Theory –Probability distributions -Decision Theory-Bayes Decision Theory -Information Theory.

UNIT II SUPERVISED LEARNING 9 Hours

Linear Models for Regression -Linear Models for Classification –Naïve Bayes -Discriminant Functions -Probabilistic Generative Models -Probabilistic Discriminative Models-Bayesian Logistic Regression. Decision Trees-Classification Trees-egression Trees -Pruning. Neural Networks -Feed-forward Network Functions -Back-propagation. Support vector machines -Ensemble methods-Bagging-Boosting.

UNIT III UNSUPERVISED LEARNING 9 Hours

Clustering-K-means -EM Algorithm-Mixtures of Gaussians. The Curse of Dimensionality-Dimensionality Reduction -Factor analysis -Principal Component Analysis -Probabilistic PCA-Independent components analysis.

UNIT IV PROBABILISTIC GRAPHICAL MODELS 9 Hours

Graphical Models -Undirected graphical models-Markov Random Fields-Directed Graphical Models -Bayesian Networks -Conditional independence properties -Inference –Learning-Generalization -Hidden Markov Models -Conditional random fields(CRFs).

UNIT V ADVANCED LEARNING 9 Hours

Sampling–Basic sampling methods –Monte Carlo. Reinforcement Learning-K-Armed Bandit-Elements -Model-Based Learning-Value Iteration-Policy Iteration. Temporal Difference Learning-Exploration Strategies-Deterministic and Non-deterministic Rewards and Actions.

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. Computational Learning Theory -Mistake bound analysis, VC dimension.
2. Occam learning, Sample complexity analysis
3. Accuracy and confidence boosting.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1 Design a neural network for an application of your choice.

CO2 Implement probabilistic discriminative and generative algorithms for an application of your choice and analyze the results.

CO3 Use a tool to implement typical clustering algorithms for different types of applications.

CO4 Design and implement an HMM for a sequence model type of application.

CO5 Identify applications suitable for different types of machine learning with suitable justification.

REFERENCES:

1. Christopher Bishop, “Pattern Recognition and Machine Learning” Springer, 2007.
2. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.
3. EthemAlpaydin, “Introduction to Machine Learning”, MIT Press,Third Edition, 2014.
4. Tom Mitchell, "Machine Learning", McGraw-Hill, 1997.
5. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer, Second Edition, 2011.
6. Stephen Marsland, “Machine Learning -An Algorithmic Perspective”, Chapman and Hall/CRC Press, Second Edition, 2014

1703CP017	EMBEDDED SOFTWARE DEVELOPMENT	L	T	P	C
		3	0	0	3

PREREQUISITE :

1. Embedded Systems
2. Computer Organization and Architecture

COURSE OBJECTIVES:

1. To understand processors and their instruction sets for embedded systems.
2. To understand hardware platform for embedded systems.
3. To design and analyze programs for embedded systems.
4. To design multi-tasking embedded systems with RTOS.
5. To understand overall embedded systems development lifecycle.

UNIT I PROCESSORS AND INSTRUCTION SETS 9 Hours

Introduction to embedded computing – overview of embedded system design process – instruction sets of processors: ARM, PIC, TI C55x, TI C64x – programming I/O – modes and exceptions – coprocessors – memory system – CPU performance – CPU power consumption.

UNIT II EMBEDDED COMPUTING PLATFORM 9 Hours

Basic computing platforms – CPU Bus – memory devices and systems – choosing a platform – development environments – debugging – consumer electronics architecture – platform-level performance analysis – design example: Audio Player.

UNIT III PROGRAM DESIGN AND ANALYSIS 9 Hours

Components for embedded programs – models of programs – Assembly, linking, and loading – compiler optimizations – program-level performance analysis – performance optimization – program-level energy optimization – optimizing program size – program validation and testing.

UNIT IV PROCESSES AND OPERATING SYSTEMS 9 Hours

Multiples tasks and multiple processes – multirate systems – pre-emptive RTOS – priority-based scheduling – inter-process communication – evaluating OS performance – processes and power optimization – Case study: Real-time and embedded Linux – design example: Telephone answering machine.

UNIT V SYSTEM DESIGN, NETWORKS, AND MULTIPROCESSORS 9 Hours

System design methodologies – requirements analysis – specifications – architecture design – quality assurance – distributed embedded systems – shared-memory multiprocessors – design example: Video accelerator.

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. Distributed Embedded Systems
2. Embedded and real time systems

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1 Develop assembly code for processors such as ARM, PIC Microcontroller, TI C55x, TI C64x, etc.
CO2 Choose appropriate hardware platform for a given application.
CO3 Perform platform-level performance analysis.
CO4 Design, develop, and debug embedded programs optimized for size or performance.
CO5 Develop embedded applications using an RTOS.

REFERENCES:

1. Marilyn Wolf, “Computers as Components: Principles of Embedded Computing Systems Design”, Third Edition, Morgan Kaufmann, 2012.
2. Christopher Hallinan, “Embedded Linux Primer: A Practical Real-World Approach”, Second Edition, Prentice Hall, 2010.
3. Karim Yaghmour et al., “Building Embedded Linux Systems”, O’Reilly, 2008.
4. Arnold S. Berger, “Embedded Systems Design: An Introduction to Processes, Tools, and Techniques”, CMP Books, 2001
5. David E. Simon, “An embedded Software Primer”, Addison-Wesley, 1999.