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Guru Nanak Dev Engineering College, Ludhiana

Department of Electronics and Communication Engineering

Syllabus

M.Tech. (Electronics and Communication Engineering)

2019 Admission Batch Onwards

Subject Code: MEC-117

Subject Name: Machine Learning

Programme: M.Tech.	**L:** 3 **T:** 0 **P:** 0
Semester: 3	**Teaching Hours:** 42 Hours
Theory/Practical: Theory	**Credits:** 3
Internal Marks: 50	**Percentage of Numerical/Design/Programming Problems :**10%
External Marks: 100	**Duration of End Semester Exam (ESE):** 3hours
Total Marks: 150	**Course Status:** Program Elective

Prerequisites: Students should have basic knowledge of artificial intelligence and neural networks

Additional Material Allowed in ESE: Scientific Calculator

On completion of the course the student will have the ability to:

CO #	Course Outcomes
1.	Learn the basics of learning problems with hypothesis and version spaces
2.	Understand the features of machine learning to apply on real world problems
3.	Characterize the machine learning algorithms as supervised learning and unsupervised learning.
4.	Apply and analyze the various algorithms of supervised and unsupervised learning
5.	Analyze the concept of neural networks for learning linear and non-linear activation functions
6.	Learn the concepts in Bayesian analysis from probability models and methods

Detailed Contents:

UNIT-I **06 hours**

Introduction: Well defined learning problems, Defining a learning system, perspectives and issues in machine learning, the concept learning task, concept learning as search, Find-S: finding a maximally specific hypothesis, version spaces and the candidate elimination algorithm, Inductive bias

UNIT-II **07 hours**

Supervised Learning: Basic methods: Distance based methods, Nearest- Neighbours, Decision Trees, Naive Bayes, Linear models: Linear regression, Logistic Regression, Support Vector Machines.

UNIT-III **07 hours**

Unsupervised Learning: Clustering: k-means/ kernel k-means, Dimensionality Reduction: PCA and kernel PCA, Matrix Factorization and Matrix Completion, Generative models (mixture models and latent factor models)

UNIT-IV **07 hours**

Decision Tree Learning: Introduction, Decision tree representation, appropriate problems for decision tree learning, the basic decision tree learning algorithm, hypothesis space search in decision tree learning, issues in decision tree learning

UNIT-V **08 hours**

Artificial Neural Networks: Introduction, Neural network representation, appropriate problems for neural network learning, McCulloch Pitts neuron model, perceptron model, backpropagation algorithm

UNIT-VI **07 hours**

Bayesian Learning: Introduction, Bayes theorem and concept learning, Maximum likelihood and least squared error hypothesis for predicting probabilities, minimum description length principle, Bayes optimal classifier, Naive bayes classifier.

Text Books:

1. Tom M. Mitchell, "Machine Learning", McGraw Hill, First Edition.
2. Ethern Alpaydin, "Introduction to Machine Learning", MIT Press, 3rd Edition.

Reference Books:

1. Chris Bishop, "Pattern Recognition and Machine Learning", Springer.
2. Kevin Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2nd Edition**.**
3. Aaron Courville, Ian Goodfellow, and Yoshua Bengio**, "**Deep Learning", MIT Press, 2015**.**
4. Sandeep Sen, Amit Kumar, "Design and Analysis of Algorithms: A Contemporary Perspective", Paperback, 2019.

E-Books and online learning material

1. Understanding Machine Learning: From Theory to Practical
https://www.cs.huji.ac.il/~shais/UnderstandingMachineLearning/understanding-machine-learning-theory-algorithms.pdf
2. Introduction to Machine Learning using Python
https://in.pycon.org/2011/static/files/talks/11/Introduction_To_ML_Partial_2.pdf
3. Machine Learning for dummies
http://lira.epac.to/DOCSTECH/Algoritmi/Machine%20Learning%20For%20Dummies%20(John%20Paul%20Mueller%20-%20Luca%20Massaron).pdf

Online Courses and Video Lectures

1. https://www.upgrad.com/machine-learning-ai-pgd-iiitb/?utm_source=Google&utm_medium=Search&utm_campaign=DV_ML_PGD_GOOGLE_SEARCH_DSA_IND_All&utm_content=Dynamic_Adgroup&utm_term=&gclid=CjwKCAjwi_b3BRAGEiwAemPNU_9OEzjOdZ67IR2iy1_9a6CcDfHw2dkjTXMULDX6ZsP75-lD4ebI6xoC_hcQAvD_BwE

2. https://cloudxlab.com/course/84/certificate-course-artificial-intelligence-deep-learning-iit-roorkee/?utm_campaign=9958452392&utm_source=google&utm_medium=ppc&utm_content=machine%20learning%20course&ad_group=101021693896&gclid=CjwKCAjwi_b3BRAGEiwAemPNU0w9T0YkPCx0rXo3Le9V_GmEbmA5VBfn1cJJVWL4HSg1Z2OvXDtpiRoCp_EQAvD_BwE
3. https://www.coursera.org/learn/machine-learning
4. https://www.youtube.com/watch?v=GwIo3gDZCVQ

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Guru Nanak Dev Engineering College, Ludhiana

Department of Electronics and Communication Engineering

Syllabus

M.Tech. (Electronics and Communication Engineering)

2019 Admission Batch Onwards

Subject Code: MEC-118

Subject Name: Advanced Wireless Sensor Networks

Programme: M.Tech.	**L:** 3 **T:** 0 **P:** 0
Semester: 3	**Teaching Hours:** 42 Hours
Theory/Practical: Theory	**Credits:** 3
Internal Marks: 50	**Percentage of Numerical/ Design/ Programming Problems:** 20%
External Marks: 100	**Duration of End Semester Exam (ESE):** 3hours
Total Marks: 150	**Course Status:** Program Elective

Prerequisites: Wireless Sensor Networks

Additional Material Allowed in ESE: Scientific Calculator

On completion of the course the student will have the ability to:

CO #	Course Outcomes
1.	Learn and understand the basic concepts of wireless sensor network
2.	Understand the WSN node Architecture and Network Architecture
3.	Select and utilize the best routing for wireless sensor networks for different applications
4.	Demonstrate the domain knowledge of time synchronization and localization techniques.
5.	Describe the fundamentals of network security in wireless sensor networks.
6.	Apply the knowledge of working principle of wireless sensor networks for utilization in different applications.

Detailed Contents:

UNIT-I **9 hours**

Introduction: Components of a wireless sensor node, Motivation for a Network of Wireless Sensor Nodes, Classification of sensor networks, Characteristics of wireless sensor networks, Challenges of wireless sensor networks, Comparison between wireless sensor networks and wireless mesh networks, Limitations in wireless sensor networks, Design challenges, Hardware architecture, Applications : Structural Health Monitoring, Traffic Control, Health Care, .Pipeline Monitoring, Precision Agriculture, Active Volcano, Underground Mining Node Architecture: The Sensing Subsystem, the Processor Subsystem, Communication Interfaces, Prototypes. Operating Systems: Functional Aspects, Nonfunctional Aspects, Prototypes, Evaluation

UNIT-II **8 hours**

Basic Architectural Framework: Physical Layer, Basic Components, Source Encoding, Channel Encoding, Modulation Medium Access Control: Wireless MAC Protocols, Characteristics of MAC Protocols in Sensor Networks, Contention-Free MAC Protocols, Contention-Based MAC Protocols, Hybrid MAC Protocols.

UNIT-III **8 hours**

Network Layer: Routing Metrics, Flooding and Gossiping, Data-Centric Routing, Proactive Routing, On-Demand Routing, Hierarchical Routing, Location-Based Routing, QoS-Based Routing Protocols Node and Network Management: Power Management, Local Power Management aspects, Dynamic Power Management, Conceptual Architecture

UNIT-IV **8 hours**

Time Synchronization: Clocks and the Synchronization Problem, Time Synchronization in Wireless Sensor Networks, Basics of Time Synchronization, Time Synchronization Protocols Localization: Ranging Techniques, Range-Based Localization, Range-Free Localization, Event Driven Localization.

UNIT-V **9 hours**

Security: Fundamentals of Network Security, Challenges of Security in Wireless Sensor Networks, Security Attacks in Sensor Networks, Protocols and Mechanisms for Security, IEEE 802.15.4 and Zig Bee Security

Text Books:

1. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice", Wiley, 2010
2. Mohammad S. Obaidat, Sudip Misra, "Principles of Wireless Sensor Networks", Cambridge, 2014

REFERENCE BOOKS:

1. Ian F. Akyildiz, Mehmet Can Vuran , "Wireless Sensor Networks", Wiley 2010
2. C S Raghavendra, K M Sivalingam, Taieb Znati, "Wireless Sensor Networks", Springer, 2010
3. C. Sivarm murthy & B.S. Manoj, "Adhoc Wireless Networks", PHI-2004
4. FEI HU., XIAOJUN CAO, "Wireless Sensor Networks", CRC Press, 2013
5. Feng ZHAO, Leonidas GUIBAS, " Wireless Sensor Networks", ELSEVIER , 2004

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Guru Nanak Dev Engineering College, Ludhiana

Department of Electronics and Communication Engineering

Syllabus

M.Tech. (Electronics and Communication Engineering)

2019 Admission Batch Onwards

Subject Code: MEC-119

Subject Name: Multimedia Communication

Programme: M.Tech.	**L:** 3 **T:** 0 **P:** 0
Semester: 3	**Teaching Hours:** 42 Hours
Theory/Practical: Theory	**Credits:** 3
Internal Marks: 50	**Percentage of Numerical/ Design/ Programming Problems:** 20%
External Marks: 100	**Duration of End Semester Exam (ESE):** 3hours
Total Marks: 150	**Course Status:** Program Elective

Prerequisites: Nil

Additional Material Allowed in ESE: Scientific calculator

On completion of the course the student will have the ability to:

CO #	Course Outcomes
1.	Comprehend the concepts of multimedia representation.
2.	Empathize various audio, video, text and image file standards.
3.	Evaluation of different coding techniques for text compression.
4.	Comparative analysis of various image file formats.
5.	Apply compression techniques for video generation.
6.	Create secure models for dissemination of multimedia content.

Detailed Contents:

UNIT-I **07 hours**

Multimedia Information Representation: Different types of multimedia information, Information representation: Text, Image, Audio, Video.

UNIT-II **08 hours**

Multimedia systems and file formats/standards : Distributed MM Systems, Multimedia processors, Multimedia OS, Various files formats for multimedia and their applications, BMP, PNG, TIFF, JPEG, DFX, AVI, MPEG Audio/ Video Standards, MPEG-1, MPEG-2, MPEG-4, MPEG-7.

UNIT-III **09 hours**

Text and Image Compression: Introduction, compression principles, Text compression techniques: GIF, TIFF, JPEG, PNG, Image compression techniques: static Huffman coding, dynamic Huffman coding, arithmetic coding, Lempel-Ziv coding. Applications of Text and Image compression in engineering.

UNIT-IV **09 hours**

Audio and Video Compression : Introduction, audio compression, DPCM, ADPCM, APC, LPC, video compression techniques, Huffman, Run length, Variable length, Lossy /lossless compression. Applications of Audio and Video compression in engineering.

UNIT-V **09 hours**

Security Issues: Transform audio coders, Image coding, video coding, Water marking techniques, Steganography techniques, Organization, Storage and retrieval, ANNs for MMSP.

Text Books:

1. Fred Halsall, "Multimedia Communications", Prentice Hall, 2002.
2. Proakis, "Digital communications", Prentice Hall, 2008.

Reference Books:

1. P. K. Andleigh and K. Thakkar, "Multimedia Systems Design", PHI, 2002.
2. Tay Vaughan, "Multimedia - Making it Work", 5/e, TMH, 2001.

Online Courses and Video Lectures

https://nptel.ac.in/courses/117/105/117105083/

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Guru Nanak Dev Engineering College, Ludhiana

Department of Electronics and Communication Engineering

Syllabus

M.Tech. (Electronics and Communication Engineering)

2019 Admission Batch Onwards

Subject Code: MEC-120

Subject Name: Low Power VLSI Design

Programme: M.Tech.	**L:** 3 **T:** 0 **P:** 0
Semester: 3	**Teaching Hours:** 42 Hours
Theory/Practical: Theory	**Credits:** 3
Internal Marks: 50	**Percentage of Numerical/ Design/ Programming Problems:** 20%
External Marks: 100	**Duration of End Semester Exam (ESE):** 3hours
Total Marks: 150	**Course Status:** Program Elective

Prerequisites: Digital Circuits

Additional Material Allowed in ESE: Scientific Calculator

On completion of the course the student will have the ability to:

CO #	Course Outcomes
1.	Comprehend the sources of power dissipation and important parameters and apply design approaches for low power VLSI.
2.	Analyze the impact of device parameters and technology on performance of low power electronics.
3.	Optimize dynamic power and static power at circuit level during standby and runtime using various techniques.
4.	Estimate and solve power related issues during clock distribution.
5.	Apply power analysis methodology and power estimation and power minimization techniques for the design of various circuits.
6.	Design and analyse low power memory cells and arithmetic circuits.

Detailed Contents:

Unit-I Introduction **05 hours**

Power and Energy basics, Sources of power dissipation in Digital Integrated circuits, important parameters for low power design, Low power design approaches.

Unit-Ii Device & Technology Impact On Low Power Electronics **06 hours**

Dynamic and Static dissipation in CMOS, transistor Sizing & gate oxide thickness, impact of technology Scaling, Technology & Device innovation.

Unit-Iii Circuit Level Power Optimization Techniques **07hours**

Dynamic Power Optimization: multiple supply voltages, transistor sizing, technology mapping. Static power Optimization: Multiple thresholds, transistor stacking, Introduction to energy recovery CMOS.

Unit-Iv Power Optimization At Standby And Runtime **08 hours**

Clock gating, power gating, body biasing, supply voltage ramping, Power reduction of memory in standby mode using voltage scaling and body biasing. Dynamic voltage and frequency scaling, adaptive body biasing, Power domains and power management.

Unit-V Low Power Clock Distribution **06 hours**

Power Dissipation in Clock Distribution, Single driver vs. Distributed buffers, Buffer and device sizing, Zero skew vs. tolerant skew, chip and package co-design of clock network.

Unit-Vi Logic Synthesis For Low Power **05 hours**

Low power design flow, power analysis methodology, Power estimation Techniques, Power Minimization Techniques.

Unit-Vii Design Of Low Power Memory And Arithmetic Elements **05 Hrs**

Memory architecture, SRAM cell metrics, power in cell array, power for read and write access, design of circuits for addition, Multiplication and Division.

Text Books:

1. J. M. Rabaey and M. Pedram, “Low Power Design Methodologies”, Kluwer- Academic Publishers.
2. A. Pal, “Low Power VLSI Circuits and Systems”, Springer.
3. K. S. Yeo and K. Roy, “Low Voltage, Low power VLSI Subsystems”, McGraw Hill Education, Edition 2009.

Reference Books:

1. N. H. Weste and D. M. Harris, “CMOS VLSI Design: A Circuits and System Perspective”, Fourth Edition, Pearson.
2. J. M. Rabaey, A. P. Chandrakasan and B. Nikolic, “Digital Integrated Circuits: A Design Perspective”, Second Edition, PH/Pearson.
3. K. Roy and S. C. Prasad, “Low-Power CMOS VLSI Circuit Design”, Wiley.
4. P. Chandrakasan and R. W. Broderson, “Low-Power CMOS Design”, IEEE Press.

Online Courses and Video Lectures

1. https://nptel.ac.in/courses/106/105/106105034/
2. https://nptel.ac.in/courses/117/101/117101004/
3. https://nptel.ac.in/courses/106/105/106105161/
4. https://nptel.ac.in/courses/108/107/108107129/
5. https://nptel.ac.in/courses/117/101/117101105/

6. https://nptel.ac.in/courses/117/101/117101058/
7. https://nptel.ac.in/courses/117/106/117106092/
8. https://nptel.ac.in/courses/117/106/117106093/
9. https://nptel.ac.in/courses/106/106/106106089/

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Guru Nanak Dev Engineering College, Ludhiana

Department of Electronics and Communication Engineering

Syllabus

M.Tech. (Electronics and Communication Engineering)

2019 Admission Batch Onwards

Subject Code: MOEC-101

Subject Name: Probability and Stochastic Processes

Programme: M.Tech.	**L:** 3 **T:** 0 **P:** 0
Semester: 3	**Teaching Hours:** 42 Hours
Theory/Practical: Theory	**Credits:** 3
Internal Marks: 50	**Percentage of Numerical/ Design/ Programming Problems: 40**%
External Marks: 100	**Duration of End Semester Exam (ESE):** 3 hours
Total Marks: 150	**Course Status:** Open elective

Prerequisites: Fundamentals of Probability Theory, Signals and its representation.

Additional Material Allowed in ESE: Scientific Calculator

On completion of the course the student will have the ability to:

CO #	Course Outcomes
1.	Apply the concepts of probability in various related engineering problems.
2.	Analyze continuous and discrete random variables in terms of density functions, distribution functions as well as statistical averages.
3.	Comprehend the convergence of random variables using suitable techniques and apply it in engineering applications.
4.	Categorize random processes and analyze their behavior in time domain as well as frequency domain.
5.	Explain various elements of Estimation theory and make use in filtering operation.
6.	Demonstrate the use of random processes for the performance analysis of communication systems.

Detailed Contents:

UNIT-I **05 hours**

Introduction to Probability

Sets, fields, Sample space and Events; Axiomatic definitions of probability; Combinatorics: Probability on finite sample spaces; Joint and conditional probabilities, independence, total probability; Bayes' rule; Borel-Cantelli Lemma; Applications of Probability in Engineering.

UNIT-II **15 hours**

Random Variables and its Characteristics

Sets, fields, Sample space and Events; Axiomatic definitions of probability; Combinatorics: Probability on finite sample spaces; Joint and conditional probabilities, independence, total probability; Bayes' rule; Borel-Cantelli Lemma; Applications of Probability in Engineering.

UNIT-III **07 hours**

Convergence of Random Variables

Sets, fields, Sample space and Events; Axiomatic definitions of probability; Combinatorics: Probability on finite sample spaces; Joint and conditional probabilities, independence, total probability; Bayes' rule; Borel-Cantelli Lemma; Applications of Probability in Engineering.

UNIT-IV **15 hours**

Random Process

Discrete and continuous-time random processes; Probabilistic structure of a random process; Mean, Autocorrelation and Autocovariance functions; Strict-sense stationary (SSS) and Wide-sense stationary (WSS) processes; Cross-correlation function; Ergodicity and its importance.

Spectral representation of a real WSS process: Power Spectral Density; Signal Processing Applications: Signal detection and extraction; Linear Time-invariant/ shift-invariant system with WSS process as input; Analysis of communication system with white-noise as input; Spectral factorization theorem; White noise process, Gaussian process, Poisson process, Markov Process; Some examples related to engineering applications.

Text Books:

1. Roy D. Yates, David J. Goodman, "Probability and Stochastic Processes: A Friendly Introduction for Electrical and Computer Engineers", Third Edition, John Wiley & Sons, 2014.
2. H. Stark and J. W. Woods, "Probability and Random Processes with Applications to Signal Processing", Third Edition, Pearson Education, 2002.
3. S.L. Miller, D.G. Childers, "Probability and Random Processes with applications to Signal Processing and Communications", Second Edition, Elsevier Academic Press, 2004.

Reference Books:

1. Walpole, "Probability & Statistics for Engineers & Statistics", Eighth Edition, Pearson Education, 2007.
2. Papoulis and S. U. Pillai, "Probability, Random Variables and Stochastic Processes", Fourth Edition, Tata McGraw-Hill, 2002.
3. H. Kobayashi, B.L.Mark and W. Turin, "Probability, Random Processes and Statistical Analysis", First Edition, Cambridge University Press, 2012.
4. J. A. Gubner, "Probability and Random Processes for Electrical and Computer Engineers", First Edition, Cambridge University Press, 2006.
5. V. K. Rohatgi and A. K. Md. E. Saleh, "An Introduction to Probability and Statistics", Third Edition, John Wiley & Sons, 2015.
6. S. Haykin, "Communication Systems", Fourth Edition, John Wiley & Sons, 2001.

E-Books and online learning material

1. An Exploration of Random Processes for Engineers by B. Hajek
http://www.ifp.illinois.edu/~hajek/Papers/randomprocesses.html
2. Probability with Engineering Applications by B. Hajek
http://www.ifp.illinois.edu/~hajek/Papers/probability.html
3. Stochastic Processes: Theory for Applications by R.G.Gallager
https://www.rle.mit.edu/rgallager/notes.htm
4. Lectures on Probability and Random Processes by J. M. Figueroa
https://www.maths.ed.ac.uk/~jmf/Teaching/mi4a.html

Online Courses and Video Lectures

1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-041sc-probabilistic-systems-analysis-and-applied-probability-fall-2013/index.htm
2. https://nptel.ac.in/courses/117/105/117105085/
3. https://nptel.ac.in/courses/108/103/108103112/
4. https://nptel.ac.in/courses/108/106/108106106/
5. https://www.probabilitycourse.com/

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Guru Nanak Dev Engineering College, Ludhiana

Department of Electronics and Communication Engineering

Syllabus

M.Tech. (Electronics and Communication Engineering)

2019 Admission Batch Onwards

Subject Code: MOEC-102

Subject Name: Microelectromechanical System

Programme: M.Tech.	**L:** 3 **T:** 0 **P:** 0
Semester: 3	**Teaching Hours:** 42 Hours
Theory/Practical: Theory	**Credits:** 3
Internal Marks: 50	**Percentage of Numerical/ Design/ Programming Problems: nil**
External Marks: 100	**Duration of End Semester Exam (ESE):** 3hours
Total Marks: 150	Course Status: Open elective

Prerequisites: nil

Additional Material Allowed in ESE: nil

On completion of the course the student will have the ability to:

CO #	Course Outcomes
1.	Summarize the concepts of microelectronics technology
2.	Define the fundamentals of micro fabrication techniques
3.	Classify and analyze various sensors and actuators
4.	Identify and understand the different materials used for MEMS
5.	Outline the applications of MEMS to various disciplines
6.	Perform measurements on MEMS devices and analyze data

Detailed Contents:

UNIT-I

Introduction to MEMS: 4 Hours

Evolution of Micro-Electro-Mechanical Systems (MEMS), Market for MEMS, MEMS materials and properties, microelectronics technology for MEMS.

UNIT-II

Micromachining Technology: 10 Hours

Wafer cleaning and surface preparation, Oxidation, Deposition Techniques: Sputter deposition, Evaporation, Spin-on methods and CVD, VD, Lithography: Optical, X-ray and E-Beam, Etching techniques, Epitaxy, Principles of bulk and surface micromachining, Lift-off process, Doping: Diffusion and Ion Plantation, Wafer Bonding: Anodic bonding and Silicon fusion bonding, Multi User MEMS Process (MUMPs).

UNIT-III 10 Hours

Sensors and Actuators:

Mechanical sensor and actuation: Principle, Beam and Cantilever, Microplates, Capacitive effects, Piezoelectric Materials as sensing and actuating elements, Starin Measurement, Pressure measurement, Thermal sensor and actuation, Micro-Opto-Electro mechanical systems (MOEMS), Radio Frequency (RF) MEMS, Bio-MEMS, Electrostatic actuators, Electromagnetic actuators.

UNIT-IV

Accelerometers: **9 Hours**

MEMS Accelerometer: design principle and technology, Pressure sensor, Accelerometer, Gyroscope, Digital Micromirror Devices (DMD), Optical switching, Capacitive Micromachined Ultrasonic Transducers (CMUT)

UNIT-V **9 Hours**

RF MEMS:

Switches: Cantilever MEMS based switch, Inductors and Capacitors: modeling and d3esign issues of planar inductor and capacitors, RF Filters: Modeling of mechanical filters, Phase shifters: Classifications and limitations, Micro machined Antennas

Text Books:

1. Franssila Sami, " Introduction to Micro Fabrication", WILEY, 2nd Edition, 2010.
2. Nadim Maluf, "An Introduction to Microelectromechanical Syatems Engineering", Artech House, 3rd edition, 2000.
3. M. Madou, "Fundamentals of Micro Fabrication", 2nd Edition, CRC Press, 2002.
4. Mahalik Nitaigour Premchand, "MEMS", McGraw-Hill, 2007.

Reference Books:

1. Senturia Stephen D.,"Microsystem Design", Springer US, 2013.
2. StephrnBeeby, Graham Ensell, Michael Kraft, Neil White, MEMS Mechanical Sensors, Artech House, 2004.
3. V. K. Varadan et al, "RF MEMS and their Applications", Wiley, 2003
4. G. Rebeiz, "RF MEMS: Theory, Design and Technology", Wiley, 2003

E-Books and online learning material

http://biomedikal.in/2011/02/lecture-notes-on-mems-technology/

Online Courses and Video Lectures

1. http://freevideolectures.com/blog/2010/11/130-nptel-iit-online-courses/#
2. http://www.learnerstv.com/Free-engineering-Video-lectures-ltvl22-Page1.html

Guru Nanak Dev Engineering College, Ludhiana
Department of Electronics and Communication Engineering
Syllabus

M.Tech. (Electronics and Communication Engineering)

2019 Admission Batch Onwards

Subject Code: MOEC-103

Subject Name: Bio Signal Processing

Programme: M.Tech.	**L:** 3 **T:** 0 **P:** 0
Semester: 3	**Teaching Hours:** 42 Hours
Theory/Practical: Theory	**Credits:** 3
Internal Marks: 50	**Percentage of Numerical/ Design/ Programming Problems:** 20%
External Marks: 100	**Duration of End Semester Exam (ESE):** 3hours
Total Marks: 150	**Course Status:** Open elective

Prerequisites: Signals and Systems, Digital Signal Processing

Additional Material Allowed in ESE: Scientific Calculator

On completion of the course the student will have the ability to:

CO #	Course Outcomes
1.	Analyze the nature of Bio signals and related concepts
2.	Apply filters to remove noise from biomedical signals.
3.	Apply transformations technique on biomedical signals and extract the features of EEG signals.
4.	Apply signal compression techniques on biomedical signals.
5.	Analyze event detection techniques for EEG and ECG signals.
6.	Apply basics of Fourier transforms on bio signals.

Detailed Contents:

UNIT-I **09 hours**

Introduction: Classification of digital systems causal, time varying, time invariant, lumped, Basics of digital signals systems: Convolution, Auto-correlation and cross correlation, Introduction and Characteristics of Bio – Signals, Types of Signals, Measurement, stationary and non – stationary bio – signals, Application areas of Bio - Signals analysis – EEG, ECG, Introduction to DTFT.

UNIT-II **09 hours**

Processing: Basics of Z transform, definition, convergence. Inverse Z transforms, Analysis of discrete time systems using Z transforms. Discrete Fourier transforms. Properties, Inverse DFT, Introduction to FFT, Introduction to wavelets - CWT and DWT with Haar wavelet,

UNIT-III **12 hours**

Noise cancellation: Types of noise in bio signals, Digital filters: IIR and FIR, Notch filters, Optimal and adaptive filter, Weiner filtering, steepest descent algorithm, LMS adaptive algorithm, Adaptive noise canceller, cancellation of 60 Hz signal in ECG - Cancellation of maternal ECG in fetal electrocardiography, Data compression: Turning point algorithm, AZTEC algorithm

UNIT-IV **12 hours**

Cardiological and Neurological Signal Processing: Basic electrocardiography, ECG data acquisition, ECG parameters and their estimation, Use of multi-scale analysis for parameters estimation of ECG waveforms. The electrophysiological origin of brain waves, The EEG signal and its characteristics, Detection of EEG rhythms, spike and wave detection in EEG, HRV Analysis.

Text Books:

1. Rangaraj M Rangayyan "Biomedical Signal Analysis – A case study approach" Publisher: Wiley, India, 2009.
2. Reddy D C. "Modern Biomedical Signal Processing – Principles and Techniques", TMH, New Delhi, 2005.

Reference Books:

1. Arnon Cohen "Biomedical Signal Processing" Crc Pr I Llc; 2nd edition, May, 2002.
2. Akay M. "Biomedical Signal Processing", Academic press, California,1994
3. Tompkins W J "Biomedical Signal Processing", Prentice hall of India, New Delhi, 1999.
4. Bronzino J D "The Biomedical Engineering handbook", CRC and Free press, Florida, 1995.

Online Courses and Video Lectures

1. https://nptel.ac.in/courses/108/105/108105101/
2. https://nptel.ac.in/courses/117/102/117102060/
3. https://nptel.ac.in/courses/108/104/108104100/

Guru Nanak Dev Engineering College, Ludhiana
Department of Electronics and Communication Engineering
Syllabus

M.Tech. (Electronics and Communication Engineering)

2019 Admission Batch Onwards

Subject Code: MOEC-104

Subject Name: Engineering Design and Project Management

Programme: M.Tech.	**L:** 3 **T:** 0 **P:** 0
Semester: 3	**Teaching Hours:** 42 Hours
Theory/Practical: Theory	**Credits:** 3
Internal Marks: 50	**Percentage of Numerical/ Design/ Programming Problems:** 10%
External Marks: 100	**Duration of End Semester Exam (ESE):** 3hours
Total Marks: 150	**Course Status:** Open elective

Prerequisites: Students should have basic knowledge of Economics and Human Resource Management

Additional Material Allowed in ESE: Nil

On completion of the course the student will have the ability to:

CO #	Course Outcomes
1.	Develop ability to analyze and solve problems methodically as well as manage individual and team projects with appropriate consideration of engineering and financial aspects.
2.	Have an understanding of professional, ethical and social responsibilities as professional Engineer and manager.
3.	Comprehend how to select and plan a project.
4.	Discuss the characteristics of Project Management.
5.	Develop an ability to communicate effectively through oral and written presentation.
6.	Perform effectively in groups and teams as a member / leader.

Detailed Contents:

UNIT-I **05 hours**

Introduction to Engineering Design: Definition, identifying requirements & analyzing needs, Exploring and evaluating concepts, Prototyping and modeling systems, Testing, Deploying and validating a design, Documentation.

UNIT-II **06 hours**

Introduction to Project Management: Definition of a project, why project management, Project life cycle, Organization structures (functional vs. matrix and borrowed resources), Translating needs into requirements, Survey of local & global industrial economic scenario.

UNIT-III **06 hours**

Project Selection and Planning: Project selection approaches, Decision methodologies (decision trees, analytical hierarchy process), Project evaluation techniques, Estimation (costs, schedule and requirements).

UNIT-IV **05 hours**

Project Management and Leadership: Effective Leadership, Qualities of a Project Leader, Effects of Leadership on Management, Team and team development, Characteristics of successful teams.

UNIT-V **05 hours**

Project Planning and Estimating: Work breakdown structure, Scheduling techniques (precedence diagrams, PERT/CPM, Gantt and milestone charts), Budgeting techniques (S-curve, earned value) Resource allocation techniques (resource loading and levelling).

UNIT-VI **05 hours**

Risk and Quality Management Fundaments of risk, Risk Management Strategies, Quality and Quality Management, Principles of Quality Management, ISO 9000 and 14000 Standards.

UNIT-VII **05 hours**

Project Execution and Control: Project execution (configuration management), Project control (measuring work performance), Financial control (activity-based accounting), Integrated cost and schedule control (Earned value).

UNIT-VIII **05 hours**

Ethical Project Management: Professional ethics & values, Corporate social Responsibility, Dealing within an ethical selection, Group case study & task.

Text Books:

1. K. Nagarajan, "Project Management, New Age International Publishers", New Delhi.
2. Parameshwar P. Iyer, "Engineering Project Management with case studies", Vikas Publishing House Pvt. Limited, New Delhi.

Reference Books:

1. Kathy Schwalbe, "An Introduction to Project Management", Kathy Schwalbe LLC.
2. Stanley E. Portny, *"Project Management for Dummies*", John Wiley & Sons, 2015.
3. Jack Ferraro, *"Project Management for Non-Project Managers"*, AMACOM, 2012
4. Charles Stephen Lessard, Charles Lessard, Joseph Lessard, Joseph P. Lessard, *"Project Management for Engineering Design"*, Morgan & Claypool Publishers, 2007

E-Books and online learning material

1. The Project Management Starter Guide
https://www.workzone.com/wp-content/uploads/Workzone-The-Project-Management-Starter-Guide.pdf
2. Project Management for Non Project Managers.
http://www.nadc-nabn.org/wp-content/uploads/2015/09/Project-Management-for-Non-Project-Managers.pdf
3. Essential Project Management Skills

https://www.gfoa.org/sites/default/files/Combined%20Essential%20Project%20Management%20Skills%20for%20Non-Project%20Managers.pdf

Online Courses and Video Lectures

1. https://swayam.gov.in/nd2_cec20_mg07/preview
2. https://www.edx.org/course/introduction-to-project-management
3. https://www.youtube.com/watch?v=bPB67mwYezM
4. https://www.youtube.com/watch?v=r5qFLd1u0XQ

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Guru Nanak Dev Engineering College, Ludhiana

Department of Electronics and Communication Engineering

Syllabus

M.Tech. (Electronics and Communication Engineering)

2019 Admission Batch Onwards

Subject Code: MOEC-105

Subject Name: E-Waste Management

Programme: M.Tech.	**L:** 3 **T:** 0 **P:** 0
Semester: 3	**Teaching Hours:** 42 Hours
Theory/Practical: Theory	**Credits:** 3
Internal Marks: 50	**Percentage of Numerical/ Design/ Programming Problems: Nil**
External Marks: 100	**Duration of End Semester Exam (ESE):** 3hours
Total Marks: 150	**Course Status:** Open elective

Prerequisites: Nil

Additional Material Allowed in ESE: Nil

On completion of the course the student will have the ability to:

CO #	Course Outcomes
1.	Become aware of e-waste and its impact on the environment.
2.	Knowledge of legal aspects of management of e-waste.
3.	Exposure to the engineering and technical options for e-waste management.
4.	Become aware of Environment and health impacts of solid waste mismanagement.
5.	Exposure to the unique initiatives from around the world.
6.	Extraction techniques for Metal and PCBs from e-waste.

Detailed Contents:

Unit I Introduction to E-Waste Management **6 hours**

Introduction to E-Waste, E-Waste issues and challenges, Disposal and its impacts on the environment, traditional waste management methods, handling and storage of electronic waste until disposal, e-waste handling solutions for both urban and rural perspectives.

Unit II E-Waste Rules **8 hours**

E-Waste Management and Handling Rules,2011: Definitions, Salient features of E-Waste Management Rules, 2016: Responsibilities: consumer or bulk consumer, Dealer, Dismantler, Producer, Collection Centre, Recycler, Refurbisher, Transporter.

UNIT III Authorization and Registration **7 hours**

Procedure for seeking authorization and registration for handling E-Wastes: Procedure for grant of authorization, power to suspend or cancel authorization, procedure for grant of registration with state pollution control board, procedure for storage of E-Waste.

UNIT IV Solid Waste Management Rules **7 hours**

Solid waste management – Hazardous Wastes (Handling and Management) Rules 1998-Bio-medical Wastes (Handling and Management) Rules 1998-Recyclled plastics (Manufacture and Usage) Rules, 1999-Municipal Solid Waste Management Act 2003- Rules - E.I.A and Public Hearing- Ecolabeling-Eco Mark.

UNIT V Waste Electrical and Electronic Equipment (WEEE) 7 hours

Introduction, Challenges posed to the environment: direct and indirect impacts, Hazardous substances in E waste, Reduction in use of hazardous materials in the manufacture of Electrical and Electronic Equipment, Mapping E waste flows: New Geographies, WEEE management in Europe, North America, Latin America and the Caribbean, Africa and Asia (South East Asia, Higher income Asian countries, Gulf countries).

UNIT VI Recovery of Metals and PCBs from E waste 7 hours

History, Green methods versus conventional means, Bioleaching, various techniques of bioleaching, synthesis and applications of nano particles synthesized by microorganisms, Hydro metallurgical techniques, recovery of waste printed circuit boards through pyrometallurgy method.

Text Books:

1. Tchobanoglous G., Theisen H., Viquel S.A., "Integrated Solid Waste Management: Engineering, Principles and Management issues", Tata McGraw Hill Publishing Company Ltd., New Delhi.
2. CPHEEO Manual on Municipal Solid Waste Management.

Reference Books:

1. Peavy H.S., Rowe D.R., Tchobanoglous G., "Environmental Engineering", Tata McGraw Hill Publishing Company Ltd., New Delhi.
2. Cunningham W.P., Cunningham M.A., "Principles of Environmental Science", Tata McGraw Hill Publishing Company Ltd., New Delhi.
3. Johri R., "E-waste: implications, regulations, and management in India and current global best practices", TERI Press, New Delhi.
4. Krishnamoorthy B., "Environmental Management, Text Book and Cases", PHI Learning (P) Ltd., New Delhi.
5. Majeti Narasimha Vara Prasad, Meththika Vithanage, Anwesha Borthakur, " Handbook of Electronic Waste Management Ist Edition" Butterworth-Heinemann.

E-Books and online learning material:

1. https://www.classcentral.com/course/swayam-electronic-waste-management-issues-and-challenges-10111
2. https://www.environmentaljournal.org/3-5/ujert-3-5-1.pdf
3. http://www.ppcb.gov.in/Attachments/E%20Waste%20Rules/1st.pdf
4. http://www.ppcb.gov.in/Attachments/E%20Waste%20Rules/guidelines%20E-Waste.pdf
5. http://www.ppcb.gov.in/ewasterules.aspx
6. www.nptel.com