

Relevant Coursework

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This document has a list of all my relevant electives taken directly from the department issued syllabus. **The link to the official syllabus can be found here:**

<https://manipal.edu/content/dam/manipal/mu/mit/documents/ece-course-outline/B.Tech%20ECE%20Course%20outline.pdf>

ECE 4080 OBJECT ORIENTED PROGRAMMING USING C++ [3 0 0 3]

User-defined functions and overloading, recursive functions. Class specification, class objects, constructors, destructors, friend functions. Base class, inheritance and protected members, types of inheritance, virtual base classes. Virtual function, inheritance of virtual functions, hierarchical virtual functions, pure virtual functions. C++ stream classes hierarchy, stream I/O, file s and string streams, file operations, error handling, formatted I/O. Benefits of exception handling, throwing an exception, try block, catching an exception, throwing an exception, catching all exceptions.

References:

1. Schildt H., The Complete Reference C++, Tata McGrawHill,2003.
2. Lafore R., Object-Oriented Programming in C++, Pearson Education, Reprint 2011.
3. Lippmann S.B., Lajore J.,C++Primer,Pearson Education,2005.
4. Deitel P.J., Deitel H.M., C++for Programmers, Pearson Education, 2009.
5. Venugopal K. R., Buyya R., T. Ravi Shankar, Mastering C++, Tata McGraw Hill, 2011.

ELE 4061 ARTIFICIAL INTELLIGENCE [3 0 0 3]

Foundation and History of AI, State of the art, Fields of application , Performance measures, Rationality, Specification and properties of task environment, Structure of Agents, Problem solving by searching, Searching for solutions, uninformed search strategies, Informed search strategies, Heuristic functions, Local search algorithms, Online search, agents, Knowledge based agents, The Wumpus World, Propositional logic – reasoning patterns, effective inference, First order logic – Syntax and semantics, Knowledge engineering, Inference rule, forward and backward chaining, Ontological engineering, categories and objects, Processes

and intervals, reasoning systems, Truth maintenance systems, Uncertainty, Basic probability notation, Axioms, Baye's rule, Bayesian networks, Inference in Bayesian networks.

References:

1. Russell S. and Norvig P, Artificial Intelligence: A Modern Approach (3e), Pearson, 2012
2. Rich E., Knight K. and Nair S. B, Artificial Intelligence (3e), Tata McGraw Hill, 2012
3. Poole D. and Mackworth A, Artificial Intelligence: Foundations of Computational Agents (2e), Cambridge University Press, 2017
4. <http://nptel.ac.in/courses/106105077/>

ECE 4051 COMPUTER VISION [3 0 0 3]

Image formation model using pinhole camera, Linear filters and convolution, Image derivatives, Features: corners, SIFT, HOG, textures. Segmentation using clustering (K-means, Mean-Shift, Watershed) and fitting model, Segmentation and fitting using probabilistic methods (EM algorithm), Geometry of two view and Camera calibration including radial distortion, Bayes Classifier: using class histograms, using class conditional density, Support Vector machine

References:

1. Forsyth D. A. and Ponce J, Computer Vision: A Modern Approach, Pearson Education, 2003
2. Szeliski R, Computer Vision: Algorithms and Applications, Springer, 2010
3. Hartleyand R. and Zisserman A., Multiple View Geometry in Computer Vision(2e), Cambridge University Press, 2004
4. Shapiro L. and Stockman G., Computer Vision, Pearson Education, 2001

ECE 4052 MACHINE LEARNING [3 0 0 3]

Machine learning basics, Naïve Bayesian Model. Non-Parametric Techniques: Density Estimation, Parzen Windows, k- Nearest-Neighbor Estimation, K- nearest neighbor classification, Radial Basis Function Network, Learning Vector Quantization, Clustering, K-Means clustering, Competitive learning, Self-Organizing Maps, Recurrent Neural Network, Hopfield Neural Network, Adaptive Resonance Theory, Support vector machines, Statistical Hypothesis testing- t-test, ANOVA, feature selection methods – Filter based techniques and wrapper methods, Principal Component Analysis, Applications of PCA, PCA ,Independent component analysis, Voting, Error correcting output codes, Bagging, Boosting

References:

1. Alpaydin E, Introduction to Machine Learning, (2e), MIT Press. 2010.
2. Duda R.O, Hart P.E. and Stork D.G., Pattern Classification, (2e), Wiley, 2001

3. Harrington P., Machine Learning in Action, Manning Publications, 2012.
4. Bishop C. M., Pattern Recognition and Machine Learning, Springer, 2007.
5. Jensen R. and Shen Q. Computational Intelligence and Feature Selection: Rough and Fuzzy Approaches, Vol. 8, IEEE Press Series on Computational Intelligence, John Wiley and Sons, 2008

ELE 4062 SOFT COMPUTING TECHNIQUES [3 0 0 3]

Introduction to Soft computing, soft computing techniques, Artificial Neural Networks, Multilayer Perceptron, Gradient descent, Logistic discrimination, Single layer Perceptron, Training a perceptron, Multilayer perceptron, Back-Propagation Algorithm, Fuzzy Systems, Fuzzy Logic, Membership Functions, Fuzzy Controllers, Evolutionary Algorithms, Genetic Algorithms, Other Optimization Techniques, Metaheuristic Search, Traveling Salesman Problem, Introduction to hybrid systems, , Adaptive Neuro-Fuzzy Inference Systems, Evolutionary Neural Networks, Evolving Fuzzy Logic, Fuzzy Artificial Neural Networks

References:

1. Zurada M J, Introduction to Artificial Neural Systems, Jaico publication. 2016
2. Ross T J, Fuzzy Logic with Engineering Applications, Intl. edition, McGraw Hill publication, 2012.
3. Shukla A, Tiwari R, Kala R, Real Life Applications of Soft Computing, CRC Press, Taylor and Francis Group, London 2010
4. Sivanandam S.N and Deepa S.N , Principles of Soft Computing , Wiley India edition, 2009
5. Rajasekaran S. and Pai G. A. V., "Neural Networks, Fuzzy Logic and Genetic Algorithms" PHI Learning, 2003

ECE 4078: MOTION AND GEOMETRY BASED METHODS IN COMPUTER VISION

Geometric primitives, 2D/3D transformations, image features, Image registration (2D/3D) of rigid and deformable objects, Tracking by detection, Tracking using optical flow and KLT, Tracking linear dynamical models with Kalman filters, Epipolar geometry, Binocular reconstruction, Local and global methods for binocular fusion, Structure from motion: Internally calibrated perspective cameras, Uncalibrated weak perspective cameras, Uncalibrated perspective cameras, Active range sensors, Range image registration

References:

1. Forsyth D.A., and Ponce J, Computer Vision: A Modern Approach, Pearson Education, 2003.
2. Szeliski R, Computer Vision: Algorithms and Applications, Springer, 2010

3. Hartley R. and Zisserman A., Multiple View Geometry in Computer Vision, 2nd Edition, Cambridge University Press, 2004

MCA 4304 INTRODUCTION TO DATA ANALYTICS [3 0 0 3]

Introduction - data science, need for analytics, steps in data analysis projects, Data- sources of data, data sets, data warehouses, data types, privacy and confidentiality, samples vs. population. Data summarization and visualization – tables and graphs. Data Preprocessing- cleaning, transformation, dimensionality reduction. Data Analysis and Visualization – descriptive, inferential statistics, uni-variate and multivariate analysis. Grouping – Cluster Analysis- distance measures, partitioning, hierarchical, density based methods. Market Basket Analysis, Association Analysis, Market Basket Analysis. Classifiers Bayesian, k-nearest neighbor, neural network, Support Vector Machine,

Decision Trees. Prediction- Regression models, Evaluating Classification and Predictive performance, ensemble methods. Anomaly Detection. Forecasting models.

References:

1. Glenn J. Myatt, Wayne P. Johnson, Making Sense of Data I: A Practical Guide to Exploratory Data Analysis and Data Mining, 2nd Edition, John Wiley & Sons Publication, 2014.
2. Glenn J. Myatt, Wayne P. Johnson, Making Sense of Data II: A Practical Guide to Data Visualization, Advanced Data Mining Methods, and Applications, John Wiley & Sons Publication, 2009.
3. Galit Shmueli, Nitin R. Patel, and Peter C. Bruce, Data Mining for Business Intelligence, John Wiley & Sons, 2014.
4. Ian H. Witten, Eibe Frank, Mark A. Hall, Data Mining: Practical Machine Learning Tools and Techniques, Morgan Kaufmann, 2011.
5. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining, Pearson Addison Wesley, 2005.