

# IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

## Department of Computer Science & Engineering

### Master of Engineering (M.E.) [Computer Science & Engineering]

#### III Semester

S.No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory			Practical			L	T	P	
				End Sem	Mid Sem. Exam.	Quiz/ Assignment	End Sem	Term work Lab Work & Sessional					
1.	<b>PSEC-MCS301</b>	PSEC	<b>Program Specific Elective Course-III**</b>	70	20	10	–	–	<b>100</b>	3	–	–	<b>3</b>
2.	<b>LLC-MCS301</b>	LLC	<b>Liberal Learning Course</b>	70	20	10	–	–	<b>100</b>	1	–	–	<b>1</b>
3.	<b>SBC-MCS301</b>	SBC	<b>Dissertation Phase-I</b>	–	–	–	120	80	<b>200</b>	–	–	20	<b>10</b>
<b>Total</b>				<b>140</b>	<b>40</b>	<b>20</b>	<b>120</b>	<b>80</b>	<b>400</b>	<b>4</b>	<b>0</b>	<b>20</b>	<b>14</b>

<b>Program Specific Elective Course-III</b>	<b>Liberal Learning Course</b>
PSEC-MCS301(A) Simulation & Modeling of Natural Processes	LLC-MCS301(A) Business (Management, Entrepreneurship, etc.)
PSEC-MCS301(B) Pattern Recognition	LLC-MCS301(B) Education (Education System, Policies, Importance, etc.)
PSEC-MCS301(C) Machine Learning with Tensor flow	LLC-MCS301(C) Philosophy
PSEC-MCS301(D) Neural Network and Deep Learning	LLC-MCS301(D) Personality Development

1 Hr Lecture	1 Hr Tutorial	2 Hr Practical
1 Credit	1 Credit	1 Credit

\*\*This can be completed by online MOOC Course.

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**Department of Computer Science & Engineering**  
**III-Semester**

<b>PSEC-MCS301</b>	<b>Simulation and Modeling of Natural Processes</b>	<b>3L (3 hrs.)</b>	<b>3 credits</b>
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**Prerequisite:** Mathematics, Introductory Physics and Numerical methods, Scientific computing

**Course Objective:**

The objective of this course is to study of simulation modeling and replicating the practical situations in organizations and develop simulation model using heuristic methods.

**Course Contents: (40 hrs.)**

**Module 1: (06 hrs.)**

Introduction to modeling and simulation, Modeling and simulation methodology, system modeling, concept of simulation, continuous and discrete time simulation.

**Module 2: (06 hrs.)**

Basic concept of probability, random variables, continuous and discrete random variables, Compartmental models: linear, nonlinear and stochastic models.

**Module 3: (10 hrs.)**

Introduction to Queuing Theory: Characteristics of queuing system, Poisson's formula, birth- death system, equilibrium of queuing system, analysis of M/M/1 queues. Application of queuing theory in computer system like operating systems, computer networks etc.

**Module 4: (08 hrs.)**

System Dynamics modeling: Identification of problem situation, preparation of causal loop diagrams and flow diagrams, equation writing, level and rate relationship, Simulation of system dynamics models.

**Module 5: (10 hrs.)**

Verification and validation: Design of simulation experiments, validation of experimental models, testing and analysis, Simulation languages comparison and selection, study of Simulation s/w - SIMULA, DYNAMO, STELLA, POWERSIM.

## **Course Outcome:**

1. Describe the role of important elements of discrete event simulation and modeling paradigm.
2. Understand the Basic concept of probability, random variables.
3. Understand the concepts of queuing theory and system.
4. Interpret the model and apply the results to resolve critical issues in a real world environment.
5. Understand the core concepts of verification, validation and study of simulation software.

## **List of Text / Reference Books:**

1. Jerry Banks, John S Carson, Berry L Nelson, David M Nicol, “Discrete Event system Simulation”, Pearson Education, Asia, 4th Edition, 2007.
2. Geoffrey Gordon, “System Simulation”, Prentice Hall publication, 2nd Edition, 1978.
3. Averill M Law, W David Kelton, “Simulation Modelling & Analysis”, McGraw Hill International Editions – Industrial Engineering series, 4th Edition, ISBN: 0-07-100803-9.
4. Narsingh Deo, “Systems Simulation with Digital Computer”, PHI Publication (EEE), 3rd Edition, 2004.

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**III-Semester**

<b>PSEC- MCS301</b>	<b>Pattern Recognition</b>	<b>3L (3 hrs.)</b>	<b>3 credits</b>
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**Prerequisite:** Mathematics, Image Processing, Programming Experience (MATLAB/C/C++)

**Course Objective:**

The objective of this course is to focus on pattern recognition techniques which are used to design automated systems.

**Course Contents: (40 hrs.)**

**Module 1: (06 hrs.)**

Introduction – Definitions, data sets for Pattern, Application Areas and Examples of pattern recognition, Design principles of pattern recognition system, Classification and clustering, supervised Learning, unsupervised learning, Pattern recognition approaches, Decision Boundaries

**Module 2: (12 hrs.)**

Classification: introduction, application of classification, types of classification, decision tree, naïve bayes, logistic regression , support vector machine, random forest, K- Nearest Neighbour Classifier and variants, Efficient algorithms for nearest neighbor classification, Different Approaches to Prototype Selection, Combination of Classifiers, Training set, test set, standardization and normalization.

**Module 3: (10 hrs.)**

Different Paradigms of Pattern Recognition, Representations of Patterns and Classes, Unsupervised Learning & Clustering, Criterion functions for clustering, Clustering Techniques, Iterative square, error partition clustering, K means, hierarchical clustering, Cluster validation

**Module 4: (06 hrs.)**

Introduction of feature extraction and feature selection, types of feature extraction , Problem statement and Uses, Algorithms - Branch and bound algorithm, sequential forward / backward selection algorithms

**Module 5: (06 hrs.)**

Recent advances in Pattern Recognition, Structural PR, SVMs, FCM, Soft computing and Neuro-fuzzy techniques, and real-life examples, Histograms rules, Density Estimation, Nearest Neighbor Rule, Fuzzy classification.

**Course Outcome:**

1. Understand the basic concepts of pattern recognition and applications.
2. Understand pattern recognition theories, such as Bayes classifier, linear discriminate analysis.
3. Gain knowledge about state-of-the-art algorithms used in pattern recognition research.
4. Apply pattern recognition techniques in practical problems of feature extraction and feature selection.
5. Understand recent advances in pattern recognition system.

**List of Text / Reference Books:**

1. Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification", 2nd Edition, John Wiley, 2006.
2. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2009.
3. S. Theodoridis and K. Koutroumbas, "Pattern Recognition", 4<sup>th</sup> Edition, academic Press, 2009.
4. Robert Schalkoff, "pattern Recognition: statistical, structural and neural approaches", JohnWiley & sons , Inc, 2007.

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**III-Semester**

<b>PSEC- MCS301</b>	<b>Machine Learning with Tensor Flow</b>	<b>3L (3 hrs.)</b>	<b>3 credits</b>
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**Prerequisite:** Soft Computing and Artificial Intelligence

**Course Objective:**

The objective of this course is to learn various concepts of machine learning and algorithms.

**Course Contents: (40 hrs.)**

**Module 1: (10 hrs.)**

Introduction to machine learning and Deep learning, scope and limitations, regression, probability, statistics and linear algebra, convex optimization, data visualization, hypothesis function and testing, data distributions, data preprocessing, data augmentation, normalizing data sets, machine learning models, supervised and unsupervised learning.

**Module 2: (10 hrs.)**

Overview of Tensor flow, Steps in Machine Learning Process, Loss Functions in Machine Learning, Gradient Descent, Gradient Descent Variations, Model Selection and Evaluation, Machine Learning Visualization,,

**Module 3: (06 hrs.)**

Deep Learning, Introduction to Tensors , Mathematical Foundations of Deep Learning, Building Data Pipelines for Tensor flow

**Module 4: (10 hrs.)**

Text Processing with Tensor flow, Classify Images, Regression, Classify Structured Data, Text Classification, Underfitting and Overfitting, Save and Restore Models, Transfer learning with pretrained, Transfer learning with TF hub, Image classification and visualization, Estimator API, Logistic Regression, Boosted Trees

**Module 5: (04 hrs.)**

Introduction to word embeddings, Recurrent Neural Networks , Time Series Forecasting with RNNs, Text Generation with RNNs.

## **Course Outcome:**

1. Understand basic concepts of machine learning and deep learning.
2. Gain knowledge about Tensor flow.
3. Understand mathematical foundation and data pipeline of tensor flow.
4. Apply text processing with tensor flow.
5. Understand word embeddings and concept of RNN.

## **List of Text / Reference Books:**

1. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer-Verlag New York Inc., 2<sup>nd</sup> Edition, 2011.
2. Tom M. Mitchell, "Machine Learning", McGraw Hill Education, First edition, 2017.
3. Ian Goodfellow and Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press, 2016.
4. Aurelien Geon, "Hands-On Machine Learning with Scikit-Learn and Tensorflow: Concepts, Tools, and Techniques to Build Intelligent Systems", Shroff/O'Reilly; First edition (2017).
5. Francois Chollet, "Deep Learning with Python", Manning Publications, 1 edition (10 January 2018).
6. Andreas Muller, "Introduction to Machine Learning with Python: A Guide for Data Scientists", Shroff/O'Reilly; First edition (2016).
7. Russell, S. and Norvig, N. "Artificial Intelligence: A Modern Approach", Prentice Hall Series in Artificial Intelligence. 2003.

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**III-Semester**

PSEC-MCS301	Neural Network and Deep Learning	3L (3 hrs.)	3 credits
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**Prerequisite:** Data Structure and Algorithm, Artificial Intelligence

**Course Objective:**

The main objective of this subject is to introduce major deep learning algorithms, the problem settings, and their applications to solve real world problems.

**Course Contents: (40 hrs.)**

**Module 1: (08 hrs.)**

Introduction to neural network, Biological and artificial neuron, Single layer perception, Multilayer Perception, Supervised and Unsupervised learning, Back propagation networks, Kohonen's self organizing networks, Hopfield network.

**Module 2: (08 hrs.)**

Introduction: Various paradigms of learning problems, Feed forward neural network, Artificial Neural Network, activation function, multi-layer neural network, Training Neural Network, Risk minimization, loss function, regularization, model selection, and optimization.

**Module 3: (08 hrs.)**

History of Deep Learning, Perspectives and Issues in deep learning framework, review of fundamental learning techniques, Threshold Logic, Activation functions, Gradient Descent (GD), Momentum Based GD, Stochastic GD, Eigen value Decomposition

**Module 4: (08 hrs.)**

Conditional Random Fields: Linear chain, partition function, Markov network, Belief propagation, Training CRFs, Hidden Markov Model, Entropy, Deep Feed Forward network, regularizations, training deep models, dropouts, Convolution Neural Network, Recurrent Neural Network, Deep Belief Network.

**Module 5: (08 hrs.)**

Probabilistic Neural Network, Hopfield Net, Boltzman machine, RBMs, Sigmoid net, Auto encoders, Deep Learning research, Object recognition, sparse coding, computer vision, natural language processing, Deep Learning Tools: Caffe, Theano, Torch.



## **Course Outcome:**

1. Understand the basic concepts of neural network.
2. Understand deep learning concepts to solve real-world problems.
3. Use the deep learning algorithm to calculate weight gradients in a feed forward neural network.
4. Apply different neural network architectures and models for a given problem
5. Understand various applications of neural network and general framework and tools.

## **List of Text / Reference Books:**

1. Jacek M. Zurada, "Introduction to Artificial Neural Systems", PWS Publishing Company, 1995.
2. Simon Haykin, "Neural Networks: A Comprehensive Foundation, Macmillan College Publishing Company", 1994.
3. Mohamad H. Hassoun, "Fundamentals of Artificial Neural Networks", The MIT Press, 1995.
4. Laurene Fausett, "Fundamentals of Neural Networks: Architectures, Algorithms, and Applications", Prentice Hall International, Inc., 1994.
5. B. D. Ripley, "Pattern Recognition and Neural Networks", Cambridge University Press. 1996.
6. Ian Goodfellow and YoshuaBengio and Aaron Courville, "Deep Learning, An MIT Press book".
7. Richard O. Duda, Peter E. Hart, David G. Stork, John Wiley & Sons Inc.-"Pattern Classification".
8. Sutton and Barto, "Reinforcement Learning: An Introduction", 2nd Edition.
9. Marco Wiering and Martijn van Otterlo, Eds, "Reinforcement Learning: State-of-the-Art".

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**III-Semester**

LLC-MCS301	Business (Management, Entrepreneurship, etc.)	1L (1 hrs.)	1 credits
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**Prerequisite:** Basic knowledge of management and business, Project Management

**Course Objective:**

The objective of this course is to focus on Business Management and Entrepreneurship.

**Course Contents: (16 hrs.)**

**Module 1: (04 hrs.)**

Meaning and concept of entrepreneurship, History of entrepreneurship development, Role of entrepreneurship in economic development, Myths about entrepreneurs, Agencies in entrepreneurship management, future of entrepreneurship, types of entrepreneurs.

**Module 2: (4 hrs.)**

Why to become entrepreneur, the skills/ traits required to be an entrepreneur, Creative and Design Thinking, the entrepreneurial decision process, skill gap analysis, and role models, mentors and support system, entrepreneurial success stories.

**Module 3: (02 hrs.)**

Meaning and concept of E-cells, advantages to join E-cell, significance of E-cell, various activities conducted by E-cell

**Module 4: (03 hrs.)**

Importance of communication, barriers and gateways to communication, listening to people, the power of talk, personal selling, risk taking & resilience, negotiation, Business Management.

**Module 5: (03 hrs.)**

Introduction to various forms of business organization (sole proprietorship, partnership, corporations, Limited Liability Company), mission, vision and strategy formulation.

## **Course Outcome:**

1. Develop awareness about entrepreneurship and successful entrepreneurs.
2. Develop an entrepreneurial mind-set by learning key skills such as design, personal selling, and communication.
3. Understand the DNA of an entrepreneur and assess their strengths and weaknesses from an entrepreneurial perspective.
4. Practice critical talents and traits required for entrepreneurs such as problem solving, creativity, communication, business math, sales, and negotiation.
5. Understand the value of mentorship in the success of an entrepreneur and their ventures.

## **List of Text / Reference Books:**

1. Ramachandran , Entrepreneurship Development, Mc Graw Hill.
2. Katz , Entrepreneurship Small Business, Mc Graw Hill.
3. Byrd Megginson,,Small Business Management An Entrepreneur's Guidebook 7th ed, McGrawHill.
4. Fayolle A (2007) Entrepreneurship and new value creation. Cambridge, Cambridge University.
5. Press Hougaard S. (2005) The business idea. Berlin, Springer.
6. Lowe R and S Mariott (2006) Enterprise: Entrepreneurship & Innovation. Burlington, Butterworth Heinemanns.
7. Léo-Paul Dana ,World Encyclopedia of Entrepreneurship, , Edward Elgar.

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**III-Semester**

LLC-MCS301	Education (Education System, Policies, Importance, etc.)	<b>1L (1 hrs.)</b>	<b>1 credits</b>
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**Prerequisite:** +2 Level knowledge, ability to conduct themselves in a mature manner when they interact with the people

**Course Objective:**

The objective of this course is to focus on Education System, Policies and Importance.

**Course Contents: (16 hrs.)**

**Module 1:** **(04 hrs.)**

Challenges in achieving universal elementary education, Demands of diverse social groups towards education, Role of education in creating positive attitude towards diversity, impact of Urbanization, Industrialization, Globalization, modernization, Digitalization

**Module 2:** **(04 hrs.)**

Aims and purposes of education drawn from constitutional provision, Fundamental Rights & Duties of Citizens, Constitutional interventions for universal of education and RTE Act 2009, Role of Central and State governments in the development of education

**Module 3:** **(04 hrs.)**

Emerging trends in the interface between: political process and education, economic developments and education, Socio-cultural changes and education, Idea of Common education System, National System of Education

**Module 4:** **(02 hrs.)**

ICT Development in Educations, New Education Policy

**Module 5:** **(02 hrs.)**

Issues of quality and equity, Challenges in Implementation of RTE Act 2009, Meaning of equality and constitutional provisions

## **Course Outcome:**

1. Understand the role of socio-cultural context in shaping human development.
2. Develop theoretical perspectives towards constitutional provision.
3. Analyze Emerging trends in the interface between political process and education.
4. Understand ICT developments in Educations.
5. Understand quality, equity, constitution provisions and challenges in implementation of RTE Act 2009.

## **List of Text / Reference Books:**

1. Anand, C.L. et.al. (1983). Teacher and Education in Emerging in Indian Society, NCERT, New Delhi.
2. Govt. of India (1986), National Policy on Education, Min. of HRD, New Delhi.
3. Govt. of India (1992). Programme of Action (NPE). Min of HRD.
4. Govinda, R. (2011). Who goes to school?: Exploring exclusion in Indian education.
5. Krishnamurti, J. (1992). Education and world peace. In Social responsibility.
6. Krishnamurti Foundation.
7. Kumar, K. (2013). Politics of education in colonial India. India: Routledge.
8. Mani, R.S. (1964). Educational Ideas and Ideals of Gandhi and Tagore, New Book Society, New Delhi.
9. Manoj Das (1999), Sri Aurobindo on Education, National Council for Teacher• Education, New Delhi.
10. Mohanty, J., (1986). School Education in Emerging Society, Sterling Publishers.
11. Mukherji, S.M., (1966). History of Education in India, Acharya Book Depot, Baroda.
12. GOI(1964-1966):‘Education and National Development’’. Ministry of Education, Government of India 1966.

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**III-Semester**

LLC-MCS301	Philosophy	<b>1L (1 hrs.)</b>	<b>1 credits</b>
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**Prerequisite:** +2 Level knowledge, ability to conduct themselves in a mature manner when they interact with the people

**Course Objective:**

The objective of this course is to focus on different philosophies.

**Course Contents: (16 hrs.)**

**Module 1:** **(06 hrs.)**

What is Logic, Sentences, Judgments, Statements and Propositions, Arguments, Truth, Validity and Soundness, Symbolic Logic, Logical Constants and Variables, Truth Functions, Negation, Conjunction, Disjunction, Implication, Equivalence, Tautology, Contradictory and Contingent Techniques of Symbolization and Construction of Truth Tables

**Module 2:** **(3 hrs.)**

Nature of Social and Political Philosophy, Nature of Scope of Social and Political Philosophy, Social Philosophy and Sociology, Political Philosophy and Political Science

**Module 3:** **(2 hrs.)**

Major Concept of individual and Society, State and Sovereignty, Nation

**Module 4:** **(02 hrs.)**

Social and Political Ideas, Liberty and Equality, Fraternity, Justice, Philosophy of religion.

**Module 5:** **(03 hrs.)**

Political Concepts, Democracy, Socialism, Fascism and Anarchism, Nature of Transformation, Tradition and Reform, Rebellion, Change and Revolution

## **Course Outcome:**

1. Study of logic helps to think logically and critically.
2. Understand the moral concepts of Social and Political Philosophy.
3. Understand the major concepts of individual and Society.
4. Study political and social ideas.
5. Understand political concepts, democracy and socialism.

## **List of Text / Reference Books:**

1. D.D. Raphael, Problem of Political Philosophy, London, MacMillan, 1979.
2. A. Quinton, Political Philosophy, Oxford University Press, 1982.
3. P. Laslett, Philosophy, Politics and Human Society, Oxford, basil Blackwell, 1972.
4. Bertrand Rusell, Authority and individual London, Unwin Book Publishers, 1974.
5. M. K. Gandhi, Hind Swaraj or Indian Home Rule, Ahmendabad, Navajivan Publishing House, 1978.
6. Chattjopadhaya, D.P ., Societies and Culture, Bharathia Vindhya Bhavan, Chapter-II.
7. De-george Richard, T., "The Pradox of Violence", Ethics and Society1 MacMillan, 1968. Article: Marcuse. H., "Ethics and Revolution".
8. S. Miri, & J. Pal(ed.), Introduction of Social & Political Philosophy, NEHU Publications, 2002.

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**III-Semester**

LLC-MCS301	Personality Development	1L (1 hrs.)	1 credits
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**Prerequisite:** +2 Level knowledge, ability to conduct themselves in a mature manner when they interact with the people

**Course Objective:**

The objective of the program is to build self-confidence, enhance self-esteem and improve overall personality of the participants

**Course Contents: (16 hrs.)**

**Module 1: (04 hrs.)**

The concept personality, Dimensions of theories of Freud & Erickson, personality, significant of personality development, Concept of success and failure, Hurdles in achieving success, what is failure, Causes of failure. SWOT analyses.

**Module 2: (04 hrs.)**

Attitude, Concept, Significance, Factors affecting attitudes: Positive attitude, Negative attitude, Ways to develop positive attitude, Difference between personalities having positive and negative attitude, Significance, Internal and external motives, Importance of self-motivation

**Module 3: (03 hrs.)**

Term self-esteem, Advantages, Do's and Don'ts to develop positive self-esteem, Low self esteem, Symptoms Personality having low self esteem, Positive and negative self esteem, Interpersonal Relationships, difference between aggressive, submissive and assertive behaviors

**Module 4: (03 hrs.)**

Body language, Problem-solving, Conflict and Stress Management, Decision-making skills, Leadership and qualities of a successful leader, Character-building, Team-work, Time management, Work ethics, Good manners and etiquette

**Module 5: (02 hrs.)**

Resume building, The art of participating in Group Discussion, Acing the Personal (HR & Technical), Interview, Frequently Asked Questions, Psychometric Analysis, Mock Interview Sessions.



## **Course Outcome:**

1. An ability to broaden the education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
2. Understand professional and ethical responsibility and apply them in engineering practices.
3. An ability to communicate effectively with the engineering community and with society at large.
4. Understanding of the engineering and management principles and apply them in project and finance management as a leader and a member in a team.
5. An ability to recognize the need for, and an ability to engage in life-long learning

## **List of Text / Reference Books:**

1. Seven Habits Of Highly Effective People – Stephen Covey
2. You Can Win – Shiv Khera
3. Three Basic Managerial Skills For All – Hall Of India Pvt Ltd New Delhi
4. Hurlock Elizabeth B Personality Development Tata Mcgraw Hill New Delhi
5. Understanding Psychology: By Robert S Feldman. ( Tata McGraw Hill Publishing)
6. Personality Development and Career management: By R.M.Onkar (S Chand Publications)
7. Social Psychology: By Robert S Feldman. ( Tata McGraw Hill Publishing)
8. Mcgrath Eh Basics Management Skills For All Printish Hall Of India Pvt Ltd New Delhi
9. Wehtlel David A and Kin S Kemerron – Developing Managerial Skills – Pearson Education
10. Effective Business Communication – H.Murphy.

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**III- Semester**

SBC-MCS301	Dissertation Phase-I	<b>20 P</b>	<b>10 credits</b>
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**Prerequisite:** Knowledge of Core Subject of CSE and Basic knowledge of Research Domains

**Course Objective:**

This course is designed to encourage design projects where students take what they have learned throughout the course of their ME program and apply it examine a specific idea. The students pursuing this course have to submit a thesis at the end of the last semester.

**Course Outcomes (CO):**

1. Investigate and identify the real world problems.
2. Design, develop and implement a domain specific design/research problem.
3. Develop acumen for higher education and research.
4. Enhance technical report writing skills.
5. Understand importance of research articles and learning preparation of research papers.

