

10. Details of Course:

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S.No.	Contents	Contact Hours
1.	Introduction: Nature and significance of economics, Goods and Utility, Basic Concept of Demand and Supply, Elasticity of Demand-Price elasticity of Demand, Cross elasticity of Demand, Production - Production Function, Production Process and Factors of Production, Market – Introduction to Monopoly, Perfect Competition, Oligopoly and Monopolistic Competition, Cost Concepts- Opportunity Cost, Total Cost, Average Cost; Marginal Cost; Life Cycle cost, Sunk Cost; Preparation of Cost Sheet Profit Maximisation- numerical problem.	10
2.	Money- its evaluation and function, Bank- Commercial Bank and Central Bank and brief idea about function of banking system:. Tax and Subsidy, Type of Tax- Direct and Indirect, Monetary and fiscal policy, Inflation and Business cycle, International trade, terms of Trade, Gain from International Trade, Free Trade vs. Protection, Dumping, Balance of Payment.	10
3.	Role of Science, Engineering and Technology in Economic Development: Seven salient Feature of the Indian Economy; Inclusive Growth; relevance for the Indian Economy; Globalisation& opening up of the Indian Economy; GDP- definition and Its measurement; How knowledge of engineering and ology may be used to improve life at slum; Green Revolution and White revolution. Reasons for their success and can we replicate them. Appropriate Technology & Sustainable Development. Entrepreneurship: Macro environment for promotion of entrepreneurship: How environment has changed after advent of IT and Globalisation.	12
4.	Elementary Economic Analysis: Interest formulas and their Applications; Calculations of economic equivalence, Bases for Comparison of Alternatives: Present Worth Method, Future worth method, Annual equivalent, Internal Rate of Return; Business Risk; Factors which should be taken care while deciding price of the product in the market.	10
TOTAL		42

1. **Subject Code: CO301** **Course Title: Software Engineering**
2. Contact Hours : L: 3 T: 0 P: 2
3. Examination Duration (ETE)(Hrs.) : Theory 3 Hrs Practical 0
4. Relative Weightage : CWS 15 PRS 15 MTE 30 ETE 40 PR 0
5. Credits : 4
6. Semester : IV
7. Subject Area : DCC
8. Pre-requisite : Nil
9. Objective : To introduce fundamentals of software engineering including requirement specifications, software design, testing and maintenance.

SE

10. Details of Course

S.No.	Contents	Contact Hours
1.	Introduction: Introduction to software Engineering, Software characteristics, Software components, Software applications, Software Engineering Principles, Software metrics and measurement, monitoring and control. Software development life-cycle, Water fall model, prototyping model, Incremental model, Iterative enhancement Model, Spiral model.	8
2.	Software Requirement Specification: Requirements Elicitation Techniques, Requirements analysis, Models for Requirements analysis, requirements specification, requirements validation.	8
3.	System Design: Design Principles: Problem partitioning, abstraction. Top down and bottom up – design, structured approach. Functional versus object oriented approach of design, design specification, Cohesiveness and Coupling. Overview of SA/SD Methodology, structured analysis, data flow diagrams, extending DFD to structure chart.	6

4.	Software project Management: Project planning and Project scheduling. Software Metrics: Size Metrics like LOC, Token Count, Function Count. Cost estimation using models like COCOMO. Risk management activities. Software Reliability and Quality Assurance: Reliability issues, Reliability metrics, reliability models, Software quality, ISO 9000 certification for software industry, SEI capability maturity model.	8
5.	Testing: Verification and validation, code inspection, test plan, test case specification. Level of testing: Unit, Integration Testing, Top down and bottom up integration testing, Alpha and Beta testing, System testing and debugging. functional testing, structural testing, Software testing strategies.	8
6.	Software Maintenance: Structured Vs unstructured maintenance, Maintenance Models, Configuration Management, Reverse Engineering, Software Re-engineering.	4
TOTAL		42

11. Suggested Books

S.No.	Name of Books / Authors/ Publishers
Text Books	
1.	R. S. Pressman, "Software Engineering – A practitioner's approach", 3 rd ed., McGraw Hill Int. Ed,1992
Reference Books	
1.	K. K. Aggarwal & Yogesh Singh, "Software Engineering", 2 nd Ed., New Age International,2005
2.	Sommerville, "Software Engineering", Addison Wesley,2001

1. **Subject Code: CO 303** **Course Title: Theory of Computation**
2. Contact Hours : L: 3 T: 1 P: 0
3. Examination Duration (ETE)(Hrs.) : Theory 3 Hrs Practical 0
4. Relative Weightage : CWS 25 PRS 0 MTE 25 ETE 50 PR 0
5. Credits : 4

TOC

6. Semester : V
7. Subject Area : DCC
8. Pre-requisite : Elementary set theory, Relations, Mappings, and some abstract algebra
9. Objective : To provide knowledge and skills in theoretical foundations of computing that are needed to study and practice computer science.

10. Details of Course

S.No.	Contents	Contact Hours
1.	Introduction: Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem.	8
2.	Regular expression (RE): Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages. Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.	8
3.	Context free grammar (CFG): Definition, Examples, Derivation , Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF,	6
4.	Context Free Languages (CFL): Closure properties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs.	6

5.	Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA.	6
6.	Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory.	10
TOTAL		42

11. Suggested Books

S.No.	Name of Books / Authors/ Publishers/ Year of Publication/ Reprint
Text Books	
1	Hopcroft, Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education. ISBN-13: 978-0321455369, 2006
2	K.L.P. Mishra and N.Chandrasekaran, "Theory of Computer Science Automata, Languages and Computation", PHI, ISBN-10: 8120329686, 2007
Reference Books	
1.	Martin J. C., "Introduction to Languages and Theory of Computations", TMH, ISBN 978-0-07-319146-1, 2010
2.	Papadimitrou, C. and Lewis, C.L., "Elements of the Theory of Computation", PHI, ISBN-13: 978-0132624787
3.	Peter Linz, "An Introduction to Formal Language and Automata", Third Edition, Narosa Publishers, New Delhi, ISBN 0-7637-142
4.	Kamala Krithivasan and Rama. R, "Introduction to Formal Languages, Automata Theory and Computation", Pearson Education, ISBN 978-81-317-2356-2

11. Suggested Books

S.No.	Name of Books / Authors/ Publishers/ Year of Publication/ Reprint
Text Book	
1.	Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers. ISBN 1558605584, 2000
Reference Book	
1.	Data Compression The Complete Reference, 4th ed. by David Salomon. ISBN-13: 978-1-84628-602-5, 2007

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|--------------------------------------|---|---|-------|-------------|-------------|
| 1. Subject Code: CO325 | Course Title: Probability and Statistics | | | | |
| 2. Contact Hours | : | L: 3 | T: 1 | P: 0 | |
| 3. Examination Duration (ETE)(Hrs.) | : | Theory 3 Hrs | | Practical 0 | |
| 4. Relative Weightage | : | CWS 25 | PRS 0 | MTE 25 | ETE 50 PR 0 |
| 5. Credits | : | 4 | | | |
| 6. Semester | : | V | | | |
| 7. Subject Area | : | DEC | | | |
| 8. Pre-requisite | : | NIL | | | |
| 9. Objective | : | To learn the language and core concepts of probability theory and understand basic principles of statistical inference. | | | |

10. Details of Course

S.No.	Contents	Contact Hours
1.	Introduction to Probability theory: Through set and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability and Axioms, Probability as a Relative Frequency, Joint and Conditional Probability: Joint Probability, Conditional Probability, Total Probability, Bayes' Theorem. Independent Events: Two Events, Multiple Events, Properties of Independent Events.	6
2.	Random Variables: Random Variable Concept, Definition of a Random Variable, Conditions for a Function to Be a Random Variable, Discrete and Continuous Random Variables, Mixed Random Variable. Distribution Function, Density Function: Existence, Properties of Density Functions. Gaussian Random Variable: Other Distribution and Density Examples: Binomial, Poisson, Uniform, Exponential, Rayleigh. Conditional Distribution and Density Functions: Conditional Distribution, Properties of Conditional Distribution, Conditional Density, Properties of Conditional Density.	8
3.	Operations on Random Variables: Expectation, Expected Value of a Random Variable, Expected Value of a Function of a Random Variable, Conditional Expected Value, Moments, Moments about the Origin, Central Moments, Variance and Skew / Chebychev's Inequality / Markov's Inequality, Chernoff's Inequality and Bound.	6
4.	Multiple Random Variables, Vector Random Variables, Joint Distribution and Its Properties, Joint Distribution Function, Properties of the Joint Distribution, Marginal Distribution Functions, Joint Density and Its Properties, Joint Density Function, Properties of the Joint Density, Marginal Density Functions, Conditional Distribution and Density, Statistical Independence, Distribution and Density of a Sum of Random Variables.	6
5.	Sampling Distributions: The Central Limit Theorem, distributions of the sample mean and the sample variance for a normal population, Chi-Square, t and F distributions. Descriptive Statistics: Graphical representation, measures of locations and variability. Estimation: Unbiasedness, consistency, the method of moments and the method of maximum likelihood estimation, confidence intervals for parameters in one sample and two sample problems of normal populations, confidence intervals for proportions, problems.	8

6.	Testing of Hypotheses: Null and alternative hypotheses, the critical and 8 acceptance regions, two types of error, power of the test, the most powerful test and Neyman-Pearson Fundamental Lemma, tests for one sample and two sample problems for normal populations, tests for proportions, Chi-square goodness of fit test and its applications, problems.	8
TOTAL		42

11. Suggested Books

S.No.	Name of Books / Authors/ Publishers/ Year of Publication/ Reprint
1.	Peebles, Probability random variables and random signal principles, 4 th Ed. Mac GrawHil, 2013
2.	Poupolis and Pillai , Random Processes and Probability, 4 th Ed., TMH, ISBN: 978-0071226615, 2002
3.	D. A. Lind, W. G. Marchal and S. A. Wathen, Statistical Technics in Business and Economics, 13 th Ed., THM. ISBN: 978-0070667075, 2007
1.	Roy D. Yates, David J. Goodman, Probability and Stochastic Processes, 3 rd Ed., Wiley, 2014
2.	Walpole, Myers, Probability and Statistics for Engineers and Scientists 9 th Ed. Pearson Education. ISBN: 9781292023922, 2013

1. Subject Code: **CO308** Course Title: **Parallel Algorithms**
2. Contact Hours : L: 3 T: 1 P: 0
3. Examination Duration (ETE)(Hrs.) : Theory 3 Hrs Practical 0
4. Relative Weightage : CWS 25 PRS 0 MTE 25 ETE 50 PR 0
5. Credits : 4
6. Semester : VI
7. Subject Area : DEC
8. Pre-requisite : Data Structures, Analysis and design of algorithms

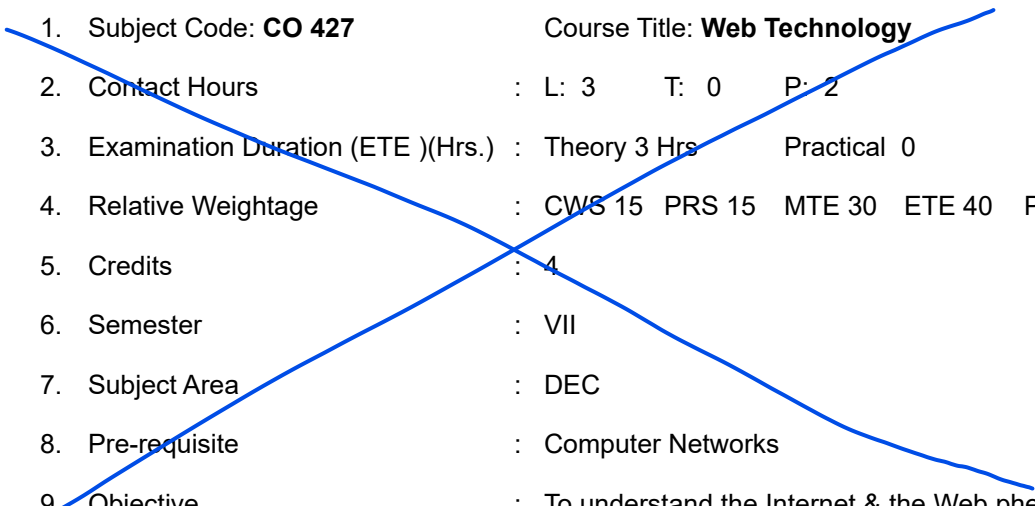
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| 1. Subject Code: CO425 | Course Title: Machine Learning | | | | |
| 2. Contact Hours | : | L: 3 | T: 1 | P: 0 | |
| 3. Examination Duration (ETE)(Hrs.) | : | Theory 3 Hrs | | Practical 0 | |
| 4. Relative Weightage | : | CWS 25 | PRS 0 | MTE 25 | ETE 50 PR 0 |
| 5. Credits | : | 4 | | | |
| 6. Semester | : | VII | | | |
| 7. Subject Area | : | DEC | | | |
| 8. Pre-requisite | : | Discrete Mathematics | | | |
| 9. Objective | : | The student should be able to understand the different supervised, unsupervised and reinforcement learning algorithms and choose the appropriate machine learning tool for different real world examples. | | | |

S.No.	Contents	Contact Hours
1.	Introduction to Machine Learning: Overview of different tasks: classification, regression, clustering, control, Concept learning, information theory and decision trees	6
2.	Supervised Learning: Decision trees, nearest neighbors, linear classifiers and kernels, neural networks, linear regression; Support Vector Machines.	8
3.	Unsupervised Learning: Clustering, Expectation Maximization, Dimensionality Reduction, Feature Selection, PCA, factor analysis, manifold learning.	8
4.	Reinforcement Learning: Value iteration; policy iteration; TD learning; Q learning; actor-critic.	6
5.	Other Topics: Bayesian learning, online learning. Learning theory, Bias Variance trade-offs	6

6.	Recent applications & Research Topics: Applications in the fields of web and data mining, text recognition, speech recognition	8
	TOTAL	42

11. Suggested Books

S.No.	Name of Books / Authors/ Publishers/ Year of Publication/ Reprint
Text Book	
1.	Introduction to Machine Learning, Alpaydin, E., MIT Press, 2004
2.	Machine Learning, Tom Mitchell, McGraw Hill, 1997.
3.	Elements of Machine Learning, Pat Langley Morgan Kaufmann Publishers, Inc. 1995. ISBN 1-55860-301-8
Reference Book	
1.	The elements of statistical learning, Friedman, Jerome, Trevor Hastie, and Robert Tibshirani. Vol. 1. Springer, Berlin: Springer series in statistics, 2001.
2.	Machine Learning: A probabilistic approach, by David Barber.
3	Pattern recognition and machine learning by Christopher Bishop, Springer Verlag, 2006

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1. Subject Code: **CO 427** Course Title: **Web Technology**
 2. Contact Hours : L: 3 T: 0 P: 2
 3. Examination Duration (ETE)(Hrs.) : Theory 3 Hrs Practical 0
 4. Relative Weightage : CWS 15 PRS 15 MTE 30 ETE 40 PR 0
 5. Credits : 4
 6. Semester : VII
 7. Subject Area : DEC
 8. Pre-requisite : Computer Networks
 9. Objective : To understand the Internet & the Web phenomena.