Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

Course Contents (Syllabus) for

Second Year M. Tech.
(Computer Science and Information Technology)

Sem – III to IV

AY 2020-21

Odd Semester/Sem-III

Professional Elective (Theory)

Title of the Course: Professional Elective 5- Graph Theory 3IT631	L	T	P	Cr
	3	0	0	3

Pre-Requisite Courses:

Textbooks:

1. Deo Narsing ,"Graph Theory With Applications To Engineering And Computer Science", 2nd Edition, PHI Publication, 2011
2. Wilson Robin J,"Introduction to Graph Theory", 5th Edition, Longman Publication, 2012

References:

1. Parthasarathy K. R.," Basic Graph Theory", McGraw-Hill Professional Publishing,3rd Edition, 1994

Course Objectives :

1. To provide basics of graph theory
2. To illustrate various properties of graph in concern with applications
3. To make able to analyze the various algorithm and applications of graph theory

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		level	Descriptor
CO1	Summarize the basic concepts of graphs, circuits and trees.	II	Understanding
CO2	apply matrix operations of graphs on real-time application	III	Applying
CO3	Design graphs for independent research.	VI	Creating

CO-PO Mapping :

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2					
CO2		1		2		
CO3	3				1	2

Assessments :

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar etc.
MSE: Assessment is based on 50% of course content (Normally first three modules)
ESE: Assessment is based on 100% course content with 70-80% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Module 1: Graphs, Paths, Circuits and Trees	Hrs.
Applications of graph, finite and infinite graphs. Subgraphs, walks, paths and circuits, Euler's graph, operations on graph, Hamiltonian paths and circuits, Properties of trees, distance and center in trees, rooted and binary trees, spanning trees.	7
Module 2: Cut sets, cut vertices, Planner and Dual graphs	**Hrs.**
Cut sets, connectivity and separability, network flows, isomorphism, Planner graphs, Kuratowski's two graphs, representation of planner graphs, detection of Planarity, Geometric dual, Combinatorial dual, thickness and crossing	6

Module 3: Vector spaces of graph and Matrix representation of graph	Hrs.
Sets with 1 and 2 operations, modular arithmetic and Galois fields, Vector and Vector spaces, basic vectors of graph, circuits and cut-set subspaces. Incident matrix, circuit matrix, cut set matrix, path matrix, and adjacency matrix.	**6**
Module 4: Coloring, covering and partitioning	**Hrs.**
Chromatic numbers, chromatic partitioning, chromatic polynomials, matching, coverings, 4 color problem,	**5**
Module 5: Directed graphs and Enumeration of graph	**Hrs.**
Types, digraphs and binary relations, directed paths and connectedness, Euler digraphs, Matrix of digraphs, paired comparisons, acyclic digraphs. Ttpes of enumeration, counting Labeled - Unlabeled trees, Polya's counting theorem.	**7**
Module 6: Graph theoretic algorithms and applications	**Hrs.**
Computer representation of graphs input and output. Basic and shortest path algorithms, DFS on graph, other graph theoretic algorithms. Applications in networks, operations research, Markov process, computer programming.	**8**

Module wise Measurable Students Learning Outcomes :
After the completion of the course the student should be able to:
Module 1: Realize basic concepts of graphs, circuits and trees.
Module 2: Analyze cut sets, cut vertices, Planner and Dual graphs.
Module 3: Apprehend matrix for graphs and apply operations on graphs.
Module 4: Apply Coloring, covering and partitioning on non-directed graph.
Module 5: Recognize directed graphs and enumeration of graph.
Module 6: Use various algorithms for graphs.

Title of the Course: Professional Elective 5 - Social Media Analysis 3IT632	L	T	P	Cr
	3	0	0	3

Pre-Requisite Courses: Data Structures

Textbooks:

1. Peter Mika, "Social Networks and the Semantic Web", First Edition, Springer 2007.
2. Borko Furht, "Handbook of Social Network Technologies and Applications", 1st Edition, Springer, 2010.

References:

1. Guandong Xu ,Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", First Edition Springer, 2011.
2. Charu C. Aggarwal, "Social Network Data Analytics", Springer; 2011

Course Objectives :

1. To introduce the concept of semantic web and related applications.
2. To instruct about analysis of human behavior in social web and related communities
3. To express visualization of social networks.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive level	Descriptor
CO1	Analyze human behavior in social web and related communities	4	Analyzing
CO2	Evaluate relationships between social networks.	5	Evaluating
CO3	Develop semantic web related applications.	6	Creating

CO-PO Mapping :

	PO1	PO2	PO3	PO4	PO5	PO6
CO1		2				
CO2					3	
CO3						3

Assessments :

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1 and ISE 2 are based on assignment, oral, seminar, test (surprise/declared/quiz), and group discussion.[One assessment tool per ISE. The assessment tool used for ISE 1 shall not be used for ISE 2]
MSE: Assessment is based on 50% of course content (Normally first three modules)
ESE: Assessment is based on 100% course content with70-80% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Module 1 Introduction	**Hrs.**
Introduction to Semantic Web: Limitations of current Web Development of Semantic Web, Emergence of the Social Web, Social Network analysis: Development of Social Network Analysis, Key concepts and measures in network analysis.	**6**
Module 2 Web Data Semantics and Knowledge Representation	**Hrs.**
Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities, Web-based networks, Applications of Social Network Analysis. Ontology and their role in the Semantic Web: Ontology-based knowledge Representation, Ontology languages for the Semantic Web: Resource Description Framework , Web Ontology Language	**7**
Module 3 Modeling And Aggregating	**Hrs.**
State-of-the-art in network data representation, Ontological representation of social individuals, Ontological representation of social relationships, Aggregating and reasoning with social network data.	**6**
Module 4 Extraction And Mining Communities	**Hrs.**
Extracting evolution of Web Community from a Series of Web Archive. Detecting communities in social networks. Definition of community. Evaluating communities. Methods for community detection and mining.	**6**
Module 5 Predicting Human Behavior And Privacy Issues	**Hrs.**
Understanding and predicting human behavior for social communities, User data management, Inference and Distribution, Enabling new human experiences, Reality mining, Context, Awareness, Privacy in online social networks, Trust in online environment.	**7**
Module 6 Visualization And Applications Of Social Networks	**Hrs.**
Graph theory, Centrality, Clustering, Node-Edge Diagrams, Matrix representation, Visualizing online social networks, Visualizing social networks with matrix-based representations, Matrix and Node-Link Diagrams	**7**

Module wise Measurable Students Learning Outcomes :

After the completion of the course the student should be able to:

Module 1: Explain key concepts of social networking.

Module 2: Analyze the different source of web data.

Module 3: Represent social nodes and their relationship.

Module 4: Define the social community using web data.

Module 5: Analyze human response towards social networks.

Module 6: Visualize graphical view of network relations.

Title of the Course: Professional Elective-5 Game Theory 3IT633	L	T	P	Cr
	3	0	0	3

Pre-Requisite Courses:

Textbooks:

2. Bonanno Giacomo, "Game Theory", Ariel Rubinstein MIT Press, 2nd Edition, 2018.

References:

1. Osborne Martin J, "An Introduction to Game Theory",Oxford University Press, 2nd Edition, 2000.
2. Martin J. Osborne, "A Course in Game Theory",Ariel Rubinstein, MIT Press. 1st Edition, 1998

Course Objectives :

1. To provide fundamentals of game theory
2. To make able to explore the dynamics of game theory
3. To make able to understand the various techniques for equilibrium

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive level	Bloom's Cognitive Descriptor
CO1	To summarize the basic concepts of Game theory.	II	Understanding
CO2	To study knowledge for game design.	IV	Analyzing
CO3	To design game with incomplete information	VI	Creating

CO-PO Mapping :

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2					
CO2		1		2		
CO3	3				1	2

Assessments :

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar etc.
MSE: Assessment is based on 50% of course content (Normally first three modules)
ESE: Assessment is based on 100% course content with 70-80% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Module 1: Ordinal Games in Strategic Form	Hrs.
Introduction to Game Theory: Game frames and games, Strict and weak dominance, Second-price auction, The pivotal mechanism, Iterated deletion procedures (IDSDS, IDWDS), Nash equilibrium, Games with infinite strategy sets, Proofs of theorems.	6
Module 2: Perfect-information and General Dynamic Games	**Hrs.**
Trees, frames and games, Backward induction, Strategies in perfect-information games, Relationship between ba kward inductio and o her solutions, Perfect-information games	6

with two players. General Dynamic Games: Imperfect Information, Strategies, Subgames, Subgame-perfect equilibrium, Games with chance moves.	
Module 3: Games with Cardinal Payoffs	**Hrs.**
Expected Utility Theory, Money lotteries and attitudes to risk, Expected utility: theorems and the axioms. Strategic-form Games: Strategic-form games with cardinal payoffs, Mixed strategies, Computing the mixed-strategy Nash equilibria, Strict dominance and rationalizability. Extensive-form Games: Behavioral strategies in dynamic games, Subgame-perfect equilibrium revisited, Problems with the notion of subgame-perfect equilibrium.	**7**
Module 4: Knowledge, Common Knowledge, Beliefs	**Hrs.**
Common Knowledge: Individual knowledge, Interactive knowledge, Common knowledge. Adding Beliefs to Knowledge: Sets and probability: a review, Probabilistic beliefs, Conditional probability and Bayes' rule, Changing beliefs in response to new information (Belief updating, Belief revision), Harsanyi consistency of beliefs or like-mindedness, Agreeing to disagree, Proof of the Agreement Theorem. Common Knowledge of Rationality: Models of strategic-form games, Common knowledge of rationality in strategic-form games, Common knowledge of rationality in extensive-form games, Proofs of Theorems.	**7**
Module 5: Refinements of Subgame-Perfect Equilibrium	**Hrs.**
Weak Sequential Equilibrium: Assessments and sequential rationality, Bayesian updating at reached information sets, A first attempt: Weak sequential equilibrium. Sequential Equilibrium: Consistent assessments, Sequential equilibrium. Perfect Bayesian Equilibrium: Belief revision and AGM consistency, Bayesian consistency Perfect Bayesian equilibrium, Adding independence (Weak independence, Strong independence), Characterization of SE in terms of PBE, History-based definition of extensive-form game, Proofs.	**7**
Module 6: Incomplete Information	**Hrs.**
Static Games: Interactive situations with incomplete information, One-sided complete information, Two-sided incomplete information, Multi-sided incomplete information. Dynamic Games: One-sided incomplete information, Multi-sided incomplete information. The Type-Space Approach: Types of players, Types that know their payoffs, The general case.	**6**

Module wise Measurable Students Learning Outcomes :
After the completion of the course the student should be able to:
Module 1: To generalize basic concepts of game theory.
Module 2: To realize perfect information games.
Module 3: To understand the strategic and dynamic games.
Module 4: To acquire common knowledge for games.
Module 5: To analyze the equilibrium of games.
Module 6: To propose a solution for static, incomplete information games.

Tutorial:

Professional Core (Lab)

Title of the Course: Dissertation Phase I 3IT690	L	T	P	Cr
	0	0	2#	4

Pre-Requisite Courses: Pre-Research Seminar

Textbooks:

References: Research journals from IEEE, ACM, Elsevier, Springer, Science Direct etc.

Course Objectives : -

1. To instruct factual knowledge, recent methods and trends in selected seminar topic.
2. To impart self-learning ability through rigorous study of literature available in selected area of interest.
3. To instruct communication guidelines for delivering a seminar, presenting the idea in effective way and reproduce it in the form of report.

Course Learning Outcomes:

CO	After completion of the course student should be able to :	Bloom's Cognitive	
		level	Descriptor
CO1	Discuss various aspects of research in the identified study area.	II	Understanding
CO2	Construct mathematical model for the specified problem	III	Applying
CO3	Compare literature estimating approaching towards optimum solution	IV	Analyzing

CO-PO Mapping :

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3			1	2	
CO2		3		2		
CO3	2				1	

Assessments :

Teacher Assessment:

Mid semester and End Semester Examination (ISE) having 50% weight to each. Assessment will be based on selection of a topic, literature survey, presentation, communication skill and documentation etc.

Course Contents:

Literature Survey: Detailed summarized literature survey from valid sources and gap Analysis.

Research Objectives: Deeply and precisely stated objectives, novel methodologies to address the dissertation work.

Significance and scope: Comprehensive topic with full of exploration at each level, importance, challenges and expected outcomes

Synopsis: Technical write up and requirement analysis to achieve defined objectives and its implementation.

Title of the Course: Dissertation Phase II 3IT691	L	T	P	Cr
	0	0	3	6

Pre-Requisite Courses: Dissertation Phase I

Textbooks:

References: Research journals from IEEE, ACM, Elsevier, Springer, Science Direct etc.

Course Objectives : -

1. To instruct factual knowledge, recent methods and trends in selected seminar topic.
2. To impart self-learning ability through rigorous study of literature available in selected area of interest.
3. To instruct communication guidelines for delivering a seminar, presenting the idea in effective way and reproduce it in the form of report.

Course Learning Outcomes:

CO	After completion of the course student should be able to :	Bloom's Cognitive	
		level	Descriptor
CO1	Choose appropriate available resources and data sets	III	Applying
CO2	Employ selected methodology leading towards proposed solution	III	Applying
CO3	Investigate the optimality of the outcomes	IV	Analyzing

CO-PO Mapping :

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	1		2		
CO2		2	3			
CO3	3				1	2

Assessments :

Teacher Assessment:

Two components of In Semester Evaluation (ISE), and End Semester Examination (ESE) having 50% weights respectively.

Assessment	Marks
ISE	50
ESE(POE)	50

Course Contents:

Objective Achieved: Approximated 30% of stated objective in synopsis, data sets to be used.

Design and Methodology: Standard design for implementation of dissertation, inline methodologies to achieve objectives.

Publications: Review/survey paper in standard publications.

Report writing: Proper citation of sources, organized section of chapters, standard and valid references, nearly absolute contents.

Even Semester/Sem-IV

Professional Core (Lab)

Title of the Course: Dissertation Phase III 3IT692	L	T	P	Cr
	0	0	2	4

Pre-Requisite Courses: Dissertation Phase II

Textbooks:

References: Research journals from IEEE, ACM, Elsevier, Springer, Science Direct etc.

Course Objectives : -

1. To instruct factual knowledge, recent methods and trends in selected seminar topic.
2. To impart self-learning ability through rigorous study of literature available in selected area of interest.
3. To instruct communication guidelines for delivering a seminar, presenting the idea in effective way and reproduce it in the form of report.

Course Learning Outcomes:

CO	After completion of the course student should be able to :	Bloom's Cognitive	
		level	Descriptor
CO1	Inspect possible application of proposed solution	IV	Analyzing
CO2	Assess performance of methodologies based on benchmarks	V	Evaluating
CO3	Devise and deploy working solution model	VI	Creating

CO-PO Mapping :

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3		1		2	
CO2		2		1		
CO3	2		3		1	2

Assessments :

Teacher Assessment:

Mid semester and End Semester Examination (ISE) having 50% weight to each. Assessment will be based on selection of a topic, literature survey, presentation, communication skill and documentation etc.

Course Contents:

Objective Achieved: Approximated 70% of stated objective in synopsis, test cases to be used.

Design and Methodology: Standard design for implementation of dissertation, inline methodologies to achieve objectives.

Analysis: Review of methodology, debugging the codes, identifications of standard benchmarks for test comparisons.

Report writing: Proper citation of sources, organized section of chapters, standard and valid references, nearly absolute contents.

Title of the Course: Dissertation Phase IV 3IT693	L	T	P	Cr
	0	0	3	12

Pre-Requisite Courses: Dissertation Phase III

Textbooks:

References: Research journals from IEEE, ACM, Elsevier, Springer, Science Direct etc.

Course Objectives : -

1. To instruct factual knowledge, recent methods and trends in selected seminar topic.
2. To impart self-learning ability through rigorous study of literature available in selected area of interest.
3. To instruct communication guidelines for delivering a seminar, presenting the idea in effective way and reproduce it in the form of report.

Course Learning Outcomes:

CO	After completion of the course student should be able to :	Bloom's Cognitive	
		level	Descriptor
CO1	Demonstrate techno socio aspects for problem solutions	III	Applying
CO2	Test and validate designed system towards fault tolerance	IV	Analyzing
CO3	Produce research findings in terms of possible technical publications and IPRs	VI	Creating

CO-PO Mapping :

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3			1	2	
CO2		3	1	2		
CO3	2				1	2

Assessments :

Teacher Assessment:

Two components of In Semester Evaluation (ISE), and End Semester Examination (ESE) having 50% weights respectively.

Assessment	Marks
ISE	50
ESE(POE)	50

Course Contents:

Objective Achieved: Fulfillment of 100% objectives stated in the synopsis.

Result Analysis and testing: Comparing the results with standard bench marks and ground truths using graphs or similar visuals, Signifying advances in the research towards identified gaps.

Publications: Result sharing through standard/indexed publication**.**

Report writing: Proper citation of sources, organized section of chapters, standard and valid references, nearly absolute contents.