E.G.S. PILLAY ENGINEERING COLLEGE

(Autonomous)

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(CSE, IT, ECE)

NAGAPATTINAM – 611002

B.TECH. INFORMATION TECHNOLOGY

R-2019

SEMESTER VI									
Course Code	**Course Name**	**L**	**T**	**P**	**C**	**Maximum Marks**			**Category**
						CA	**ES**	**Total**	
Theory Course									
1902IT601	Artificial Intelligence	3	0	0	3	40	60	100	PC
1902IT602	Mobile Computing	3	0	0	3	40	60	100	PC
1902IT603	Data Warehousing and Data Mining	3	0	0	3	40	60	100	PC
1903IT005	Multicore Programming	3	0	0	3	40	60	100	PE
1901HS004	Business Model Innovation	3	0	0	3	40	60	100	HSSE
	Open Elective- I	3	0	0	3	40	60	100	OE
Laboratory Course									
1902IT651	Data Mining Laboratory	0	0	2	1	50	50	100	PCC
1904IT651	Mobile Application Development (Mini Project II)	0	0	2	1	50	50	100	EEC
1904GE651	Life Skills: Aptitude II& GD	0	0	2	1	100	-	100	EEC
1904IT652	Industrial Visit Presentation	0	0	0	1	100	-	100	EEC
Total		**18**	**0**	**8**	**22**	**540**	**460**	**1000**	

1902IT601	ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	0	0	3

AIM: The main objective of this course is to understand the concepts of Artificial Intelligence and Computer vision.

PREREQUISITE: Computer Networks, Software Engineering and Project Management

COURSE OBJECTIVES:

1. Study the concepts of Artificial Intelligence.
2. Learn the methods of solving problems using Artificial Intelligence.
3. Introduce the concepts of Expert Systems and machine learning.

UNIT I	INTRODUCTION TO AI	9 Hours

Artificial Intelligence – Problem Solving – Production Systems – Algorithms Analysis – Searching Techniques – Case Study: Constraint Statisfication Problem, Hill Climbing

UNIT II	KNOWLEDGE REPRESENTATION	9 Hours

Knowledge Representation – Predicate Calculus – Inference – Forward & Backward Chaining – Bayes Theory – Fuzzy Approach – Case Study: Game Playing

UNIT III	PLANNING	9 Hours

Basic Plan generation – Strips Language – Scheduling - Explanation – Case Study: Graph Coloring, Reactive Systems

UNIT IV	MACHINE LEARNING	9 Hours

Machine Learning Techniques – Types – Approaches – Applications – Case Study: Ontology, Deep Learning

UNIT V	EXPERT SYSTEMS	9 Hours

Expert systems - Architecture of expert systems, Roles of expert systems – Case Study: Recommendation Systems, Smart GRID, Industrial Internet Search Engines, Social Semantics, Natural Language Processing

TOTAL: 45 Hours

FURTHER READING: Machine Vision Systems, Real Time Learning and Decision making systems

COURSE OUTCOMES

At the end of this course, students will be able to,

CO1: Understand the concepts of Artificial Intelligence and Problem Solving
CO2: Apply various knowledge representation to solve AI problems
CO3: Apply various planning techniques and case studies to develop AI designs
CO4: Use different machine learning techniques and case studies to design real time AI models
CO5: Create various expert system applications using AI recommendations

REFERENCES:

1. Kevin Night and Elaine Rich, Nair B., “Artificial Intelligence (SIE)”, McGraw Hill- 2016.
2. Dan W. Patterson, “Introduction to AI and ES”, Pearson Education, 2012.
3. Peter Jackson, “Introduction to Expert Systems”, 3rd Edition, Pearson Education, 2014.
4. Stuart Russel and Peter Norvig “AI – A Modern Approach”, 2nd Edition, Pearson Education2010.
5. Deepak Khemani “Artificial Intelligence”, Tata Mc Graw Hill Education 2013.
6. http://nptel.ac.in/

1902IT602		MOBILE COMPUTING	L	T	P	C
			3	0	0	3

AIM: This course is study various mobile communication protocols, telecommunications and MANETs

PREREQUISITE: Principles of Communication, Computer Networks

COURSE OBJECTIVES:

1. Understand the basic concepts of mobile computing.
2. Be familiar with the network protocol stack.
3. Learn the basics of mobile telecommunication system.
4. Be exposed to Ad-Hoc networks.
5. Gain knowledge about different mobile platforms and application development.

UNIT I	INTRODUCTION	9 Hours

Mobile Computing – Mobile Computing Vs Wireless Networking – Mobile Computing: Applications – Characteristics– Structure. MAC Protocols: Wireless MAC Issues – Fixed Assignment Schemes – Random Assignment Schemes – Reservation Based Schemes.

UNIT II	MOBILE INTERNET PROTOCOL AND TRANSPORT LAYER	9 Hours

Overview of Mobile IP – Features of Mobile IP – Key Mechanism in Mobile IP – route Optimization. Overview of Mobile Transport Layer, Traditional TCP Classical TCP improvements, TCP over 2.5/3G Wireless Networks, Performance Enhancing Proxies.

UNIT III	MOBILE TELECOMMUNICATION SYSTEM	9 Hours

Global System for Mobile Communication (GSM): Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services. – General Packet Radio Service (GPRS) – Universal Mobile Telecommunication System (UMTS).

UNIT IV	MOBILE AD-HOC NETWORKS	9 Hours

Overview – Characteristics of MANET – spectrum of MANET applications – Design Issues – Routing – Essential of Traditional Routing Protocols –Popular Routing Protocols – Security in MANETs – Vehicular Ad Hoc networks (VANET) – MANET versus VANET.

UNIT V	OPERATING SYSTEM FOR MOBILE DEVICES	9 Hours

Commercial Mobile Operating Systems – Features of Windows CE, PalmOS, Symbian OS, and Java Card Support for Mobility: Pile systems, WWW, Wireless Application Protocol – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – MCommerce – Structure – Pros & Cons – Mobile Payment System – Security Issues.

TOTAL:	45 Hours

FURTHER READING: On site seminar at Telecommunication networks

COURSE OUTCOMES

At the end of this course, students will be able to,

CO1: Explain the concepts of mobile computing schemes and applications
CO2: Illustrate various mobile internet protocol and their functionality in each layer applications
CO3: Apply various mobile telecommunication system techniques to process real time mobile application services
CO4: Use of various mobile ad-hoc standards to process routing schemes
CO5: Use mobile operation system to simulate mobile devices and applications

REFERENCES:

1. Prasant Kumar Pattnaik, Rajib Mall, “Fundamentals of Mobile Computing”, PHI Learning Pvt. Ltd, New Delhi – 2016.
2. Jochen H. Schller, “Mobile Communications”, Second Edition, Pearson Education, New Delhi, 2014.
3. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, 2013.
4. Uwe Hansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, 2012.
5. William.C.Y.Lee,“Mobile Cellular Telecommunications-Analog and Digital Systems”, Second Edition,Tata Mc Graw Hill Edition ,2012.
6. C.K.Toh, “AdHoc Mobile Wireless Networks”, First Edition, Pearson Education, 2012.
7. http://nptel.ac.in/

1902IT603		DATA WAREHOUSING AND DATA MINING	L	T	P	C
			3	0	0	3

AIM: The main objective of this course is used to the safe storage of data, data warehouse and data mining techniques.

PREREQUISITE: Database Management Systems

COURSE OBJECTIVES:

1. Learn about the safe storage of data and architecture of data warehouse
2. Learn about the Elimination of errors from the data
3. Understand the Deleting data that is no longer important to the organization
4. Study the extraction of implicit, previously unknown, and potentially useful information from data
5. To help in the generation of reports for the management

UNIT I	INTRODUCTION TO DATA WAREHOUSING	9 Hours

Data warehouse and OLAP technology – Types of Database – Multidimensional data model – Data warehouse architecture – Data warehouse schema – Implementation

UNIT II	DATA MINING PRIMITIVES AND CONCEPT DESCRIPTION	9 Hours

Introduction to Data mining – Preprocessing – Predictive Analysis - Data mining primitives – Data mining query language - concept description – Data generalization and characterization – Analytical characterization – Mining Descriptive statistical measures in large databases

UNIT III	CLASSIFICATION AND PREDICTION	9 Hours

Introduction – Decision Tree Induction – Bayesian Classification – Back propagation – Lazy Learners – Other classification methods – Prediction – Evaluating the accuracy

UNIT IV	CLUSTERING AND ASSOCIATION	9 Hours

Similarity and Distance Measures – Hierarchical Algorithms – Partition Algorithms – Outlier Analysis – Mining Frequent Patterns, Associations, and Correlations

UNIT V	ADVANCED TOPICS	9 Hours

Web Mining – Web Content Mining – Structure and Usage Mining – Spatial Mining – Time Series and Sequence Mining – Graph Mining.

TOTAL:	45 Hours

FURTHER READING: Data Science, Data Analytics

COURSE OUTCOMES

At the end of this course, students will be able to,

CO1: Explain the concepts of Data Warehousing architecture and implementation
CO2: Apply different association rules to solve various dataset and mining applications
CO3: Design high dimensional data analytics system using classification and prediction techniques
CO4: Analyze large dataset using clustering and association techniques
CO5: Analyze various complex data objects and real time dataset using advanced mining techniques

REFERENCES:

1. Jiawei. Han, Micheline Kamber, "Data Mining: Concepts and Techniques", Second Edition, Elsevier, New Delhi, 2017.
2. Vipin Kumar, Michael Steinbach," Introduction to Data Mining", Second Edition, Addison Wesley, 2015.
3. Dunham M, ―Data Mining: Introductory and Advanced Topics‖, Prentice Hall, New Delhi, 2013.
4. http://nptel.ac.in/

1902IT651	DATA MINING LABORATORY	L	T	P	C
		0	0	2	1

PREREQUISITE	Database Management Systems, Java Programming, Python Programming

LIST OF EXPERIMENTS:

MODULE – 1 **10 Hours**

1. Explore machine learning tool "WEKA"
2. Perform data preprocessing tasks and Demonstrate performing association rule mining on data sets
3. Demonstrate performing classification on data sets
4. Demonstrate performing clustering of data sets
5. Demonstrate knowledge flow application on data sets

MODULE – 2 **20 Hours**

Credit Risk Assessment

The business of banks is making loans. Assessing the credit worthiness of an applicant is of crucial importance. You have to develop a system to help a loan officer decide whether the credit of a Customer is good, or bad. A bank's business rules regarding loans must consider two opposing factors. On the one hand, a bank wants to make as many loans as possible, Interest on these loans is the banks profit Source. On the other hand, a bank cannot afford to make too many bad loans. Too many bad loans could lead to the collapse of the bank. The bank's loan policy must involve a compromise: not too strict, and not too lenient. To do the assignment, you first and foremost need some knowledge about the world of credit. You can acquire such knowledge in a number of ways.

1. Knowledge Engineering. Find a loan officer who is willing to talk. Interview her and try to represent her knowledge in the form of production rules.
2. Books. Find some training manuals for loan officers or perhaps a suitable textbook on finance. Translate this knowledge from text form to production rule form.
3. Common sense. Imagine yourself as a loan officer and make up reasonable rules which can be used to judge the credit worthiness of a loan applicant.
4. Case histories. Find records of actual cases where competent loan officers correctly judged when, and when not to, approve a loan application

List all the categorical (or nominal) attributes and the real-valued attributes separately by using German credit data set or any other built-in data sets available in weka.

1. What attributes do you think might be crucial in making the credit assessment? Come up with some simple rules in plain English using your selected attributes.
2. One type of model that you can create is a Decision Tree — train a Decision Tree using the complete dataset as the training data. Report the model obtained after training.
3. Suppose you use your above model trained on the complete dataset, and classify credit good/bad for each of the examples in the dataset. What % of examples can you classify correctly? (This is also called testing on the training set) Why do you think you cannot get 100 % training accuracy?
4. Is testing on the training set as you did above a good idea? Why or Why not?
5. One approach for solving the problem encountered in the previous question is using cross validation? Describe what is cross-validation briefly. Train a Decision Tree again using cross validation and report your results. Does your accuracy increase/decrease? Why?
6. Check to see if the data shows a bias against "foreign workers" (attribute 20), or "personal-status" (attribute 9). One way to do this (perhaps rather simple minded) is to remove these attributes from the dataset and see if the decision tree created in those cases is significantly different from the full dataset case which you have already done. To remove an attribute you can use the preprocess
tab in Weka's GUI Explorer. Did removing these attributes have any significant effect? Discuss.
7. Another question might be, do you really need to input so many attributes to get good results? Maybe only a few would do. For example, you could try just having attributes 2, 3, 5, 7, 10, 17 (and the class attribute (naturally)). Try out some combinations. (You had removed two attributes in problem 7. Remember to reload the am data file to get all the attributes initially before you start selecting the ones you want.)
8. Sometimes, the cost of rejecting an applicant who actually has a good credit (case 1) might be higher than accepting an applicant who has bad credit (case 2). Instead of counting the mis classifications equally in both cases, give a higher cost to the first case (say cost 5) and lower cost to the second case. You can do this by using a cost matrix in Weka. Train your Decision Tree again and report the Decision Tree and cross-validation results. Are they significantly different from results obtained in problem 6 (using equal cost)?

9. Do you think it is a good idea to prefer simple decision trees instead of having long complex decision trees? How does the complexity of a Decision Tree relate to the bias of the model?
10. You can make your Decision Trees simpler by pruning the nodes. One approach is to use Reduced Error Pruning – Explain this idea briefly. Try reduced error pruning for training your Decision Trees using cross-validation (you can do this in Weka) and report the Decision Tree you obtain? Also, report your accuracy using the pruned model. Does your accuracy increase?
11. (Extra Credit): How can you convert a Decision Trees into "if-then else rules". Make up your own small Decision Tree consisting of 2-3 levels and convert it into a set of rules. There also exist different classifiers that output the model in the form of rules – one such classifier in Weka is rules. PART, train this model and report the set of rules obtained. Sometimes just one attribute can be good enough in making the decision, yes, just one! Can you predict what attribute that might be in this dataset? OneR classifier uses a single attribute to make decisions (it chooses the attribute based on minimum error). Report the rule obtained by training a one R classifier. Rank the performance of j48, PART and oneR.

Requirement for a batch of 30 students
Software:

Operating System: Windows /Linux operating system
Tool: Weka Tool / R Programming / Python

References

https://www.cs.waikato.ac.nz/ml/weka
https://weka.wikispaces.com

Task Resources
1. Mentor lecture on Decision Trees
2. Andrew Moore's Data Mining Tutorials
3. Decision Trees (Source: Tan, MSU) Tom Mitchell's book slides
5. Jiawei. Han, Micheline Kamber, "Data Mining: Concepts and Techniques", Second Edition, Elsevier, New Delhi, 2017.
6. Vipin Kumar, Michael Steinbach," Introduction to Data Mining", Second Edition, Addison Wesley, 2015.
7. Dunham M, ―Data Mining: Introductory and Advanced Topics‖, Prentice Hall, New Delhi, 2013.

http://nptel.ac.in/

TOTAL:	**30 Hours**

1904IT651		MOBILE APPLICATION DEVELOPMENT (MINI PROJECT II)	L	T	P	C
			0	0	2	1

AIM: This course is used to students will understand and develop mobile apps as a team/individual and useful of society

PREREQUISITE: Java Programming, Web Programming

COURSE OBJECTIVES:

1. Introduce mobile application development tools
2. Design and develop useful mobile applications with compelling user interfaces
3. Create their own layouts and Views using Menus
4. Transfer apps to mobile.

a. Study of basics of mobile application development
   a. Introduction to Mobile Computing
   b. Introduction to
   c. Android Development Environment

b. Study of Factors in Developing Mobile Applications
   a. Mobile Software Engineering
   b. Frameworks and Tools
   c. Generic UI Development
   d. Android User

To develop a mini-project using following problem statements and project selection based on real time and social issues

1. Designing of UIs - VUIs and Mobile Apps, Text-to-Speech Techniques, Designing the Right UI
2. Multichannel and Multimodial UIs
3. Study of Intents and Services - Android Intents and Services, Characteristics of Mobile Applications, Successful Mobile Development
4. Storing and Retrieving Data - Synchronization and Replication of Mobile Data, Getting the Model Right, Android Storing and Retrieving Data, Working with a Content Provider
5. Communications Via Network and the Web - State Machine, Correct Communications Model, Android Networking and Web
6. Telephony - Deciding Scope of an App, Wireless Connectivity and Mobile Apps, Android Telephony
7. Notifications and Alarms – Performance, Performance and Memory Management, Android Notifications and Alarms
8. Graphics - Performance and Multithreading, Graphics and UI Performance, Android Graphics
9. Multimedia - Mobile Agents and Peer-to-Peer Architecture, Android Multimedia
10. Location - Mobility and Location Based Services, Android
11. Putting It All Together - Packaging and Deploying, Performance Best Practices, Android Field Service App
12. Security and Hacking- Active Transactions, More on Security, Hacking Android
13. Platforms and Additional Issues - Development Process, Architecture, Design, Technology Selection, Mobile App Development Hurdles, Testing

SOFTWARE REQUIREMENTS: Android Studio or Eclipse or Equivalent

TOTAL: 45 Hours

1904GE651	LIFE SKILLS: APTITUDE – II AND GROUP DISCUSSION	L	T	P	C
		0	0	2	1

Course Objectives:

The students should be made to:

1. To brush up problem solving skill and to improve intellectual skill of the students
2. To be able to critically evaluate various real life situations by resorting to Analysis Of key issues and factors
3. To be able to demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.
4. To enhance analytical ability of students
5. To augment logical and critical thinking of Student

Unit I	PARTNERSHIP, MIXTURES AND ALLEGATIONS, PROBLEM ON AGES, SIMPLE INTEREST, COMPOUND INTEREST	6 Hours

Introduction Partnership - Relation between capitals, Period of investments and Shares- Problems on mixtures - Allegation rule - Problems on Allegation – Problems on ages - Definitions Simple Interest - Problems on interest and amount - Problems when rate of interest and time period are numerically equal - Definition and formula for amount in compound interest - Difference between simple interest and compound interest for 2 years on the same principle and time period.

Unit II	BLOOD RELATIONS, CLOCKS, CALENDARS	6 Hours

Defining the various relations among the members of a family - Solving Blood Relation puzzles - Solving the problems on Blood Relations using symbols and notations - Finding the angle when the time is given - Finding the time when the angle is known - Relation between Angle, Minutes and Hours - Exceptional cases in clocks - Definition of a Leap Year - Finding the number of Odd days - Framing the year code for centuries - Finding the day of any random calendar date

Unit III	TIME AND DISTANCE, TIME AND WORK	6 Hours

Relation between speed, distance and time - Converting kmph into m/s and vice versa - Problems on average speed - Problems on relative speed - Problems on trains - Problems on boats and streams - Problems on circular tracks - Problems on races - Problems on Unitary method - Relation between Men, Days, Hours and Work - Problems on Man-Day-Hours method - Problems on alternate days - Problems on Pipes and Cisterns

Unit IV	DATA INTERPRETATION AND DATA SUFFICIENCY	6 Hours

Problems on tabular form - Problems on Line Graphs - Problems on Bar Graphs - Problems on Pie Charts - Different models in Data Sufficiency - Problems on data redundancy

Unit V	ANALYTICAL AND CRITICAL REASONING	6 Hours

Problems on Linear arrangement - Problems on Circular arrangement - Problems on Double line-up - Problems on Selections - Problems on Comparisons - Finding the Implications for compound statements - Finding the Negations for compound statements- Problems on assumption - Problems on conclusions - Problems on inferences - Problems on strengthening and weakening of arguments .

GROUP DISCUSSION

TOTAL	30 Hours

COURSE OUTCOMES:

At the end of the course, the student should be able to

CO1: Solve problems on Partnership, Mixture & Allegation and ages least time using shortcuts and apply real life situations.

CO2: Workout family relationships concepts, ability to visualize clocks & calendar and understand the logic behind a Sequence.

CO3: Calculate concepts of speed, time and distance, understand timely completion using time and work.

CO4: Learners should be able to understand various charts and interpreted data least time.

CO5: Workout puzzles, ability to arrange things in an orderly fashion

REFERENCES:

1. Arun Sharma, 'How to Prepare for Quantitative Aptitude for the CAT', 7th edition, McGraw Hills publication, 2016.
2. Arun Sharma, 'How to Prepare for Logical Reasoning for CAT', 4th edition, McGraw Hills publication, 2017.
3. R S Agarwal, 'A modern approach to Logical reasoning', revised edition, S.Chand publication, 2017.
4. R S Agarwal, 'Quantitative Aptitude for Competitive Examinations', revised edition, S.Chand publication, 2017.
5. Rajesh Verma, "Fast Track Objective Arithmetic", 3rd edition, Arihant publication, 2018.
6. B.S. Sijwalii and Indu Sijwali, "A New Approach to REASONING Verbal & Non-Verbal", 2nd edition,

Arihnat publication, 2014

ASSESSMENT PATTERN :

1. Two tests will be conducted (25 * 2) - 50 marks
2. Two assignments will be conducted (2*10) - 20 Marks.
3. Group Discussion – 30 marks

1904IT652	INDUSTRIAL VISIT PRESENTATION	L	T	P	C
		0	0	2	1

In order to provide the experiential learning to the students, shall take efforts to arrange at least two industrial visit / field visits in a year. A presentation based on Industrial visits shall be made in this semester and suitable credit may be awarded.

Internal Assessment Only	
Test	40
Presentation / Quiz / Group Discussion	40
Report	20
Grades (Excellent / Good / Satisfactory / Not Satisfactory)	

1903IT005	MULTICORE PROGRAMMING	L	T	P	C
		3	0	0	3

AIM: This course is provide the advance concepts of process and controllers

PREREQUISITE: Computer Organization and Architecture, Operating Systems

COURSE OBJECTIVES:

1. Understand the recent trends in the field of computer architecture and identify performance related parameters
2. Appreciate the need for parallel processing
3. Understand the challenges in parallel and multi-threaded programming
4. To understand the different types of multicore architectures

UNIT I **INTRODUCTION TO MULTICORE PROCESSORS** **9 Hours**

Scalable design principles – Principles of processor design – Instruction Level Parallelism, Thread level parallelism. Parallel computer models – Symmetric and distributed shared memory architectures – Multi-core Architectures - Software and hardware multithreading – SMT and CMP architectures – Design issues – Case studies – Intel Multi-core architecture – SUN CMP architecture.

UNIT II **PARALLEL PROGRAMMING** **9 Hours**

Performance Issues – Scalability – Synchronization and data sharing – Data races – Synchronization primitives (mutexes, locks, semaphores, barriers) – deadlocks and live locks communication between threads (condition variables, signals, message queues and pipes).

UNIT III **OPEN MP PROGRAMMING** **9 Hours**

OpenMP – Threading a loop – Thread overheads – Performance issues – Library functions. Solutions to parallel programming problems – Data races, deadlocks and live locks – Non-blocking algorithms – Memory and cache related issues.

UNIT IV **MPI PROGRAMMING** **9 Hours**

MPI Model – MPI constructs – MPI Library –Point-to-point and Collective communication – data decomposition – communicators and topologies – MPI derived data types – Performance evaluation

UNIT V **MULTITHREADED APPLICATION DEVELOPMENT** **9 Hours**

Case studies – n-Body solvers – Tree Search – OpenMP and MPI implementations and comparison – Algorithms, program development and performance tuning.

TOTAL: 45 Hours

FURTHER READING: Case study of Testing tools like Rational Robot, Amazon Tools

COURSE OUTCOMES

At the end of this course, students will be able to,

CO1: Understand the limitations of ILP and the need for multicore architectures
CO2: Compare and Correlate the issues related to multiprocessing system and suggest solutions
CO3: Solve open MP problems using Parallel Processors
CO4: Use of MPI Programming and topologies to solve multi programming objects
CO5: Develop multithreaded application using OpenMP and MPI.

REFERENCES:

1. Shameem Akhter and Jason Roberts, “Multi-core Programming”, Intel Press, 2016.
2. Michael J Quinn, Parallel programming in C with MPI and OpenMP, Tata Macgraw Hill, 2013.
3. Peter S. Pacheco, “An Introduction to Parallel Programming”, Morgan-Kauffman/Elsevier, 2011.
4. John L. Hennessey and David A. Patterson, “ Computer architecture – A quantitative approach”, Morgan Kaufmann/Elsevier Publishers, 4th. edition, 2011.
5. David E. Culler, Jaswinder Pal Singh, “Parallel computing architecture : A hardware/ software approach” , Morgan Kaufmann/Elsevier Publishers, 2012.
6. http://nptel.ac.in/

1901HS004	BUSINESS MODEL INNOVATION	L	T	P	C
		3	0	0	3

PREREQUISITE:

The course assumes no prior skill or background in design, art, engineering, or prototyping. It is open to all undergraduates and graduate students with an interest in learning design thinking, and is especially recommended for those students planning social-venture and other kinds of design interventions

COURSE OBJECTIVES:

1. Understand the Business Model Canvas
2. Master the different types of Innovation
3. Design Innovative Business Models
4. Differentiate from Competition
5. Understand purchasing psychology
6. Define innovative revenue models

Module I	INTRODUCTION TO BUSINESS MODELS	9 Hours

Introduction to Business Model Generation, Business Model Canvas, Examples: Uber Innovation Model, Facebook, Customers, Value Proposition, Sales & Delivery Channels, Customer Relationships, Revenue Streams, Resources, Activities, Partners

Module II	INTRODUCTION TO DESIGNING INNOVATIVE BUSINESS MODELS, PRODUCT AND DESIGN INNOVATION	9 Hours

Disrupting Markets, Examples; AirBnb model, Better Product, Success stories of Tinder and Uber – Case studies, Visual Design, Tesla Innovation Model

Module III	CUSTOMER INNOVATION: CUSTOMER NICHES, SALES & DELIVERY CHANNELS, MARKETING	9 Hours

Disrupting Customer Relationships, Acquire first time customer, Disrupting Customer segments, Focus on underserved market niche, Disrupt delivery Channels, Digital Sales channel

Module IV	RESOURCE DRIVEN INNOVATION	6 Hours

New product development strategies, Innovative production techniques, Automation of small and medium companies

Module V	REVENUE MODEL INNOVATION & PURCHASING PSYCHOLOGY	12 Hours

Disrupting revenue models, Subscription models, Freemium and Micro payments, advertising, affiliates and franchising, Why People Buy – Necessity, Loss Aversion, Fear, Convenience, Belonging & Vanity, Scarcity

TOTAL: 45 HOURS

Course Outcomes:

At the end of the course, students will be able to,

CO1: Describe Key Concepts and basics of Design Thinking Principles

CO2. Elaborate the Design Thinking Approach through IDEO's method & Customer Journey Maps

CO3. Conduct user interviews and synthesize learnings to uncover insights and identify opportunities for innovation

CO4. Develop Design Driven Innovative Solutions to Real World Problems

FURTHER READING:

1. HBR's 10 Must Reads on Business Model Innovation (with featured article "Reinventing Your Business Model" by Mark W. Johnson, Clayton M. Christensen, and Henning Kagermann) (English, Paperback, Review Harvard Business)
2. The Business Model Book (Adam J. Bock, Gerard George)
3. The Field guide to Human Centered Design by IDEO.org

REFERENCES:

1. The Business Model Innovation Factory: How to Stay Relevant When The World is Changing Hardcover – April 24, 2012, Saul Kaplan

2. Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation Book by Tim Brown, 2009

3. The business model navigator is a book that comes out from the research of Oliver Gassmann, Karolin Frankenberger, and Michaela Csik.

4. Business Model Generation: A Handbook for Visionaries, Game…by Alexander Osterwalder

5. Testing Business Ideas: A Field Guide for Rapid Experimentation (Strategyzer) 1st Edition by David J. Bland (Author), Alexander Osterwalder

6. https://nptel.ac.in/courses/109104109/