TULSIRAMJI GAIKWAD-PATIL
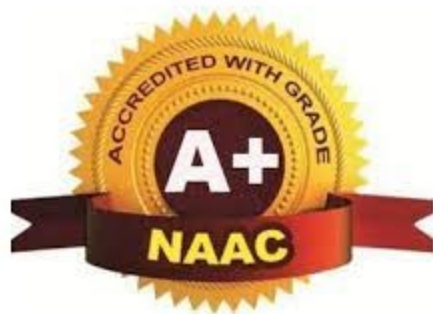## College of Engineering & Technology

Mohgaon, Wardha Road, Nagpur - 441 108

An Autonomous Institute

A+
NAAC
ACCREDITED WITH GRADE

DEPARTMENT OF INFORMATION TECHNOLOGY

B.Tech. Information Technology

VI Semester

Syllabus

From

Academic Year 2023-24

Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur

SCHEME OF INSTRUCTION & SYLLABI

Programme: Information Technology

Scheme of Instructions: Third Year B.Tech.in Information Technology

Semester – VI

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits	CT1	CT2	TA/CA	ESE	TOTAL
1	PCC	BIT3601	Data Warehousing & Mining	3	-	-	3	3	15	15	10	60	100
2	PCC	BIT3602	Software Engineering & Project Management	3	-	-	3	3	15	15	10	60	100
3	PCC	BIT3603	Software Engineering & Project Management Lab	-	-	2	2	1	-	-	25	25	50
4	PCC	BIT3604	Data Warehousing & Mining Lab	-	-	2	2	1	-	-	25	25	50
5	PCC	BIT3605	Advanced JAVA Lab	-	-	2	2	1	-	-	25	25	50
6	PROJ	BIT3606	Mini Project#	-	-	2	2	1+1@	-	-	50	50	100
7	PEC	BIT3607-10*	Program Elective-III	3	-	-	3	3	15	15	10	60	100
8	PEC	BIT3611-14*	Program Elective-IV	3	-	-	3	3	15	15	10	60	100
9	HSMC	BIT3615	Engineering Economics & Management	3	-	-	3	3	15	15	10	60	100
10	OEC	B$$XX01-16#	Open Elective –II	3	-	-	3	3	15	15	10	60	100
11	MCC	BAU3606	Social Awareness	2	-	-	2	Audit	-	-	-	-	-
			Total	**20**	**-**	**8**	**28**	**23**	**90**	**90**	**185**	**485**	**850**

@ Every Student will undergo Industrial Training/Internship of Two weeks in summer vacation after B.E.VI Sem. Examinations, upon successful completion of industrial training/internship 01 credit will be awarded after submission of the report in prescribed format.

L- Lecture   T-Tutorial   P-Practical   CT1- Class Test 1   CT2- Class Test 2   TA/CA- Teacher Assessment/Continuous Assessment

ESE- End Semester Examination (For Laboratory End Semester performance)

* Indicates out of the four course codes each student has to select any one PEC from the list provided at the end of structure.

 # Indicates out of the 16 course codes each student has to select any one OEC except BITXX03 & BITXX04 from the list provided at the end of structure.

Course Category	HSMC (Hum., Soc. Sc, Mgmt.)	BSC (Basic Sc.)	ESC (Engg. Sc.)	PCC (Programme Core courses)	PEC (Programme Elective courses)	OEC (Open Elective coursesfrom other discipline)	Project / Seminar / Industrial Training	MCC (Mandatory Courses)
Credits	3	--	--	09	06	03	02	Yes
Cumulative Sum	12	25	23	42	12	07	03	--

PROGRESSIVE TOTAL CREDITS: 101+23=124

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Vice Principal
TulsiRamji Gaikwad Patil
College Of Engineering &
Technology, Nagpur

Principal
Tulsiramji Gaikwad-Pa
College Of Engineerin
Technology, Nagpu

Program: Information Technology

List of Electives offered by Information Technology Department

Semester-VI			
Course Code	Program Elective- III	Course Code	Program Elective- IV
BIT3607	Mobile Computing	BIT3611	Parallel Processing
BIT3608	Computer Forensics	BIT3612	Fundamental of Convolutional Neural Network
BIT3609	Deep Learning	BIT3613	Cloud Computing
BIT3610	Supply Chain Management	BIT3614	Human Computer Interface

List of Open Electives Offered

Sr. No.	Name of Host Programme	Open Elective Course Code	Title of the Course
1.	Computer Science & Engineering	BCSXX01	Cyber Law and Ethics
2.	Computer Science & Engineering	BCSXX02	Blockchain Technology
3.	Information Technology	BITXX03	Cyber Security
4.	Information Technology	BITXX04	Artificial Intelligence
5.	Electronics and Communication Engineering	BECXX05	Internet of Things
6.	Electronics and Communication Engineering	BECXX06	Embedded Systems
7.	Civil Engineering	BCEXX07	Introduction to Art and Aesthetics
8.	Civil Engineering	BCEXX08	Metro Systems and Engineering
9.	Mechanical Engineering	BMEXX09	Nanotechnology and Surface Engineering
10.	Mechanical Engineering	BMEXX10	Automobile Engineering
11.	Electrical Engineering	BEEXX11	Power Plant Engineering
12.	Electrical Engineering	BEEXX12	Electrical Materials
13.	Aeronautical Engineering	BAEXX13	Avionics
14.	Aeronautical Engineering	BAEXX14	Unmanned Aerial Vehicles
15.	Biotechnology	BBTXX15	Biomaterials
16.	Biotechnology	BBTXX16	Food and Nutrition Technology

Third Year (Semester-VI) B. Tech. Information Technology

BIT3601: Data Warehousing And Mining

Teaching Scheme			Examination Scheme	
Theory	3 Hrs/week		CT-I	15 Marks
Tutorial	-		CT-II	15 Marks
Total Credits	3		CA	10 Marks
			ESE	60 Marks
			Total	100 Marks
			Duration of ESE: 3Hrs	

Course Objectives:

1.	To introduce students to the basic concepts and techniques of Data Mining.
2.	To introduce a wide range of clustering, estimation, prediction, and classification algorithms.
3.	To introduce mathematical statistics foundations of the Data Mining Algorithms.
4.	To introduce basic principles, concepts and applications of data warehousing.
5.	To apply data mining techniques to solve problems in big data analysis.

Course Contents

Unit I	**Introduction to Data Warehousing:** Evolution of decision support systems, Failure of past decision support system, Operational v/s decision support systems, Data warehousing lifecycle, Architecture, Building blocks, Components of DW, Data Marts and Metadata
Unit II	**Data Preprocessing:** Why preprocess the data? Descriptive data summarization, Data cleaning, Data integration and transformation, Data reduction, Data Discretization and Concept Hierarchy Generation.
Unit III	**OLAP Analytical Processing:** OLAP in Data warehouse, Demand for online analytical processing, need for multidimensional analysis, limitations of other analysis methods, OLAP definitions and rules, OLAP characteristics, major features and functions. OLAP models-ROLAP, MOLAP, HOLAP, Differentiation, Data cubes and operations on cubes
Unit IV	**Introduction of Data Mining:** Motivation, Importance, Data Mining functionalities, KDD and Data Mining, Data Mining v/s Query tools, **Mining Frequent Patterns and Association:** Basic Concepts: Market Basket analysis, motivating example, Frequent Item sets, Closed Item sets and Association rules, Frequent Pattern Mining Efficient and Scalable Frequent Item set. Mining Methods: Apriori Algorithm, Generating Association rules from Frequent Item sets, mining various kinds of association rules.

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	Business Intelligence and Big Data:
Unit V	BI-Defining Business Intelligence, Important factors in BI, BI Architecture, BI framework, Development of BI system, BI applications in Marketing, Logistics and Production, Retail Industry. Big Data: - Understanding the challenges of Big data, Big data meets hadoop. Hadoop: Meeting Big data challenges, Hadoop Ecosystem, Core components, developing applications with Hadoop.

Text Books

T.1	Data Mining (Concepts and Techniques) - Han and Kamber
T.2	Data Mining and Business Intelligence - Shinde and Chandrashekhar, Dreamtech Press

Reference Books

R.1	Introduction to Data Mining – Tan, Steinbach, Vipin Kumar, Pearson Education.
R.2	Fundamentals of Data Warehouses, Jarke, Vassiliou, 2nd Edition, Springer.

Useful Links

1	https://nptel.ac.in/courses/106/105/106105174/
2	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs12/

	Course Outcomes	**CL**	**Class Sessions**
BIT3601.1	Describe the fundamental concepts of data warehousing, data marts and metadata.	2	9
BIT3601.2	Illustrate the data pre-processing concepts.	3	9
BIT3601.3	Evaluate tools and technologies for accessing information from databases to improve business performance and decision making.	5	9
BIT3601.4	Discriminate KDD and concepts of data mining.	4	9
BIT3601.5	Evaluate & recognize mining frequent patterns and associations.	5	9

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Third Year (Semester-VI) B. Tech. Information Technology

BIT3602: Software Engineering & Project Management

Teaching Scheme			Examination Scheme	
Theory	3 Hrs/week		CT-I	15 Marks
Tutorial	-		CT-II	15 Marks
Total Credits	3		CA	10 Marks
			ESE	60 Marks
			Total	100 Marks
			Duration of ESE: 3Hrs	

Course Objectives:

1.	To learn and understand the principles of Software Engineering.
2.	Classify software applications and Identify unique features of various domains
3.	Design test cases of a software system.
4.	Understand basics of IT Project management.
5.	Plan, schedule and execute a project considering the risk management.

Course Contents

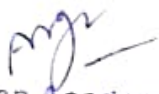| Unit I	Basics: Introduction to Software Engineering, Software Myths, Software Engineering- A Layered Technology, Software Process Framework, Software Process Models: The Waterfall Model, Incremental Process Models, Evolutionary Process Models, Specialized Process Models, Agile Process Models
Unit II	Measures Metrics and Indicator, Metrics for process & projects: Software measurement, metrics for software quality, metrics for small organization, Estimation: Software scope and Feasibility, Resources, Software project estimation, Decomposition Techniques, Empirical Estimation Models, Make-buy Decision, Project scheduling
Unit III	System Engineering: Hierarchy, Business Process Engineering, Product Engineering, System Modeling, Requirements Engineering: Requirements Analysis, Analysis Modeling Approaches, Data Modeling, Object Oriented Analysis, Scenario Based Modeling, Flow Oriented Modeling, Class based Modeling, Behavioral Model, Metrics for Analysis Models, Design Engineering Concepts, Design Model, Pattern Based Software Design, Architectural Design, Mapping data flow into software architecture
Unit IV	Cohesion, Coupling, User interface analysis and Design, Metrics for Design Models, Unit Testing, Integration Testing, Validation Testing, System Testing, Art of Debugging, Software Testing Fundamentals, Black Box Testing, White Box Testing, Metrics for Source Code, Metrics for Testing & Maintenance

| | Unit V | Risk Management: Risk strategies, Software risks, Risk identification, Risk refinement, RMMM Quality Management: Quality Concepts, Software Quality Assurance, Software Reviews, Formal Technical Review, Software Reliability, Change Management: Software Configuration Management, SCM Repository, SCM Process, Reengineering: Software reengineering, Reverse Engineering, Restructuring, Forward Engineering |

Text Books

| T.1 | Software Engineering-A Practitioner's Approach (Sixth Edition) by Roger Pressman(TMH) |
| T.2 | Software Engineering (Ninth Edition)-Ian Summerville (Pearson) |

Reference Books

| R.1 | Schaum's Outline of Theory and Problems of Software Engineering by David Gustafson (TMH) |
| R.2 | Software Engineering (Third Edition) by K. K. Aggarwal and Yogesh Singh (New age International Publishers) |

Useful Links

| 1 | https://nptel.ac.in/courses/106/105/106105182/ |
| 2 | https://nptel.ac.in/courses/106/105/106105087/ |

	Course Outcomes	CL	Class Sessions
BIT3602.1	Identify the different project contexts and suggest an appropriate management strategy.	2	9
BIT3602.2	Understand software metrics for process & projects, estimation and project scheduling.	2	9
BIT3602.3	Apply the role of professional ethics in successful software development.	3	9
BIT36024	Demonstrate the ability to understand various software engineering design concepts and metrics for design models.	3	9
BIT3602.5	Determine an appropriate project management approach through an evaluation of the business context and scope of the project.	4	9

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Third Year (Semester-VI) B. Tech. Information Technology

BIT3603: Software Engineering & Project Management Lab

Teaching Scheme			Examination Scheme	
Practical	2 Hrs/week		CA	25 Marks
Total Credits	1		ESE	25 Marks
			Total	50 Marks

Sr. No	List of Practical	CO
1	Study various phases of Software Engineering types of Models used.	CO1
2	Studying various phases of Water-Fall Model	CO1
3	Using COCOMO model estimate effort for Banking	CO2
4	Prepare SRS for banking	CO2
5	Draw the Data flow diagram for teaching staff.	CO3
6	Draw the Activity diagram for bank user.	CO3
7	Write and test a program to select the students who have scored more than 60 percentage.(unit testing)	CO4
8	To write a code to test a HTML File	CO4
9	Identify the risk involved in the project and prepare RMMM (Risk Management, Mitigation and Monitoring) plan.	CO5
10	Draw E-R diagram, DFD, CFD and STD for the project.	CO5

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	Text Books	
1	Software Engineering-A Practitioner's Approach (Sixth Edition) by Roger Pressman (TMH)	
2	Software Engineering (Ninth Edition)-Ian Summerville (Pearson)	
Reference Books		
1	Schaum's Outline of Theory and Problems of Software Engineering by David Gustafson (TMH)	
2	Software Engineering (Third Edition) by K. K. Aggarwal and Yogesh Singh (New age International Publishers)	
Useful Links		
1	https://nptel.ac.in/courses/106/105/106105182/	
2	https://nptel.ac.in/courses/106/105/106105087/	

	Course Outcomes	CL	Class Sessions
BIT3602.1	Identify the different project contexts and suggest an appropriate management strategy.	2	9
BIT3602.2	Understand software metrics for process & projects, estimation and project scheduling.	2	9
BIT3602.3	Apply the role of professional ethics in successful software development.	3	9
BIT36024	Demonstrate the ability to understand various software engineering design concepts and metrics for design models.	3	9
BIT3602.5	Determine an appropriate project management approach through an evaluation of the business context and scope of the project.	4	9

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BIT3604: Data Warehousing And Mining Lab

Teaching Scheme			Examination Scheme	
Practical	2 Hrs/week		CA	25 Marks
Total Credits	1		ESE	25 Marks
			Total	50 Marks

Sr. No	List of Practical	CO
1	Evolution of data management technologies, Introduction to Data Warehousing concept.	CO1
2	Introduction to Weka tool.	CO1
3	Execute ETL Process by using various preprocessing methods	CO2
4	Implementation of FP-Growth algorithm	CO2
5	Demonstration of Association rule process on dataset test.arff using Apriori algorithms.	CO3
6	Make an application showing classification on dataset.	CO3
7	Demonstration of classification rule process on dataset employee.arff using Classification algorithms.	CO4
8	Make an application showing classification using Decision Tree Algorithms.	CO4
9	Make an application showing naïve based classification.	CO5
10	Make an application showing L-means clustering	CO5

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Text Books		
1	Data Mining (Concepts and Techniques) - Han and Kamber	
2	Data Mining and Business Intelligence - Shinde and Chandrashekhar, Dreamtech Press	
Reference Books		
1	Introduction to Data Mining – Tan, Steinbach, Vipin Kumar, Pearson Education.	
2	Fundamentals of Data Warehouses, Jarke, Vassiliou, 2nd Edition, Springer.	
Useful Links		
1	https://nptel.ac.in/courses/106/105/106105174/	
2	https://onlinecourses.nptel.ac.in/noc20_cs12/preview	

	Course Outcomes	CL	Lab Sessions
BIT3604:1	Describe the fundamental concepts of data warehousing, data marts and metadata.	2	9
BIT3604:2	Illustrate the data pre-processing concepts.	2	9
BIT3604:3	Evaluate tools and technologies for accessing information from databases to improve business performance and decision making.	5	9
BIT3604:4	Discriminate KDD and concepts of data mining.	4	9
BIT3604:5	Evaluate & recognize mining frequent patterns and associations.	5	9

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BIT3605: Advance Java

Teaching Scheme			Examination Scheme	
Practical	2Hrs/week		CA	25Marks
Total Credits	1		ESE	25Marks
			Total	50Marks

Sr. No	List of Practical	CO
1	Write a program to create frame using AWT, Implement mouse Clicked (),mouse entered() and mouse exited() events. Frame should become visible when mouse enters it.	CO1
2	To write a java applet program to play two sound notes simultaneously using the Jframe main window in Audio Clip interface.	CO1
3	Using AWT, write a java program to create two buttons is pressed the background color should be set to the color named by the button's label.	CO2
4	Using AWT, write a program to display a string in frame window with yellow color as background.	CO2
5	Using AWT, write a program which responds to KEY_TYPED event and updates the status window with message ("Typed character is: X"). Use adapter class for other two events.	CO3
6	Write a program to check whether the number is palindrome or not	CO3
7	To write a Java program to create sample application form in JApplet using swing control	CO4
8	Write a java program to simulate the traffic signal using multithreading	CO4
9	Write an advanced Java Code for understanding features like the stream API and lambada expressions, for concise and expressive data processing.	CO5
10	Create an open-ended project on Advanced Java(open ended-project)	CO5

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Text Books		
1	AdvancedJavaProgrammingforGTUby RaviMajithia-2023	
2	JavaDesignPatterns:AHands-OnExperiencewithReal-WorldExamples"by Vaskaran Sarcar	
Reference Books		
1	CleanCode:AHandbookofAgileSoftwareCraftsmanship"byRobertC.Martin.	
2	JavaGenericsandCollections-MauriceNaftalin(Author),PhilipWadler(Author)	
Useful Links		
1	JavatpointLearningmaterial-https://www.javatpoint.com/what-is-advance-java	
2	https://enos.itcollege.ee/~jpoial/allalaadimised/reading/Advanced-java.pdf	

	Course Outcomes	CL	Lab Sessions
BIT3605.1	**Understand** the concepts of AWT, GUI, Handle mouse events, Applets, and multimedia elements	2	4
BIT3605.2	**Demonstrate** buttons, event handling, dynamic background color, interactive applications, user input and GUI	3	4
BIT3605.3	**Apply** problem solving skills, with implementation of event handling	3	4
BIT3605.4	**Examine** GUI design using Swing control and multithreading, event handling, and concurrent programming	4	4
BIT3605.5	**Formulate** concept of various fields in advance java and mathematical expressions for data processing	6	4

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Third Year (Semester-VI) B. Tech. Information Technology

BIT3607: Mobile Computing (Program Elective-III)

Teaching Scheme		Examination Scheme	
Theory	3 Hrs/week	CT-I	15 Marks
Tutorial	-	CT-II	15 Marks
Total Credits	3	CA	10 Marks
		ESE	60 Marks
		Total	100 Marks
		Duration of ESE: 3Hrs	

Course Objectives:

1. To provide an overview of Wireless Communication networks area and its applications in communication engineering.

2. To appreciate the contribution of Wireless Communication networks to overall technological growth.

3. To explain the various terminology, principles, devices, schemes, concepts, algorithms and different methodologies used in Wireless Communication Networks.

4. To enable students to compare and contrast multiple division techniques, mobile communication systems, and existing wireless networks.

5. To study the layer of android & android SDK.

Course Contents

Unit I	**Introduction to Mobile Computing:** Wireless Communication and examples, Applications cellular communication (1G to 4GNetworks), GSM (Mobile services, system architecture protocol, Localization and Calling, Handover, Security)
Unit II	**Mobile Computing Architecture:** Internet the ubiquitous network, Architecture for Mobile Computing three tier architecture, Design consideration for Mobile Computing, Mobile Computing, Mobile Computing through Internet.
Unit III	**Wireless LAN:** Wireless LAN advantages, Applications, IEEE 802.11 standards, System Architecture, Protocol Architecture, Physical layer, Medium access control layer, MAC management roaming. **Wireless Application Protocol:** WAP architecture, wireless datagram protocol, wireless transaction protocol.
Unit IV	**Mobility Management and Control:** Mobile agents, characteristics, requirement for Mobile Agent system, Platform (Aglet object Model, Agent Tcl architecture)
Unit V	**Introduction to Android:** Layer android components, Mapping applications to process, Android development basics, Hardware tools, Android SDK features.

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Text Books

T.1	Mobile Communications: 2nd Edition, Jochen Schiller, Pearson Education.
T.2	Wireless Communication-Principles and Practice-2nd Edition, Theodore S.Rappaport, PHI Publications

Reference Books

R.1	Mobile Computing- Technology, Applications and services creation-Ashok K.Talukder, Roopa R. Yavagal, TMH.
R.2	Mobile Computing-Theory and Practice-Kumkum Garg-Pearson Publications

Useful Links

1	https://nptel.ac.in/courses/106/106/106106147/
2	https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs13/

	Course Outcomes	CL	Class Sessions
BIT3607.1	**Explain** the principles and theories of mobile computing technologies.	2	9
BIT3607.2	**Describe** infrastructures and technologies of mobile computing technologies.	4	9
BIT3607.3	**Understand** fundamentals of wireless LAN & Wireless Application Protocol	2	9
BIT3607.4	**Analyze** security, energy efficiency, mobility, scalability, and their unique characteristics in wireless networks.	4	9
BIT3607.5	**Acquire** the knowledge of Android SDK features	5	9

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BIT3608: Computer Forensics(Program Elective-III)

Teaching Scheme			Examination Scheme	
Theory	3 Hrs/week		CT-I	15 Marks
Tutorial	-		CT-II	15 Marks
Total Credits	3		CA	10 Marks
			ESE	60 Marks
			Total	100 Marks
			Duration of ESE: 3Hrs	

Course Objectives:

1.	Explain and properly document the process of digital forensics analysis.
2.	Describe the representation and organization of data and metadata within modern computer systems
3.	Understanding of the tradeoffs and differences between various forensic tools
4.	To create disk images, recover deleted files and extract hidden information
5.	To define research problems and develop effective solutions.

Course Contents

Unit I	Introduction to Digital Forensics, Definition and types of cybercrimes, electronic evidence and handling, electronic media, collection, searching and storage of electronic media, introduction to internet crimes, hacking and cracking, credit card and ATM frauds, web technology, cryptography, emerging digital crimes and modules.
Unit II	Computer organization, components of computer- input and output devices, CPU, Memory hierarchy, types of memory, storage devices, system software, application software, basics of computer languages.
Unit III	Definition and Cardinal Rules, Data Acquisition and Authentication Process, Windows Systems-FAT12, FAT16, FAT32 and NTFS, UNIX file Systems, mac file systems, computer artifacts, Internet Artifacts, OS Artifacts and their forensic applications

		Introduction to Forensic Tools, Usage of Slack space, tools for Disk Imaging, Data Recovery, Vulnerability Assessment Tools, Encase and FTK tools, Anti Forensics and probable counters, retrieving information, process of computer forensics and digital investigations, processing of digital evidence.
Unit IV		
Unit V		Digital images damaged SIM and data recovery, multimedia evidence, retrieving deleted data: desktops, laptops and mobiles, retrieving data from slack space, renamed file, ghosting, compressed files.

Text Books

T.1	C. Altheide& H. Carvey Digital Forensics with Open Source Tools, Syngress, 2011.
T.2	C. Altheide& H. Carvey Digital Forensics with Open Source Tools, Syngress, 2011.

Reference Books

R.1	Handbook of Digital Forensics and Investigations, Eoghan Casey ed., Elsevier Academic Press

Useful Links

1	https://www.youtube.com/watch?v=SBY-YlHRTZ0
2	https://onlinecourses.swayam2.ac.in/cec21_ge10/preview

	Course Outcomes	CL	Class Sessions
BIT3608.1	Memorize types of cybercrimes, electronic evidence and handling, electronic media, collection, searching and storage of electronic media	1	9
BIT3608.2	Discuss the recovery of image files through basics of computer languages	2	9
BIT3608.3	Discover basic network forensic analysis and Data Acquisition and Authentication Process	3	9
BIT3608.4	Apply forensic tools for processing crime and incident scenes.	3	9
BIT3608.5	Estimate knowledge and use in multimedia forensic.	5	9

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Third Year (Semester-VI) B. Tech. Information Technology

BIT3609: Deep Learning (Program Elective-III)

Teaching Scheme			Examination Scheme	
Theory	3 Hrs/week		CT-I	15 Marks
Tutorial	-		CT-II	15 Marks
Total Credits	3		CA	10 Marks
			ESE	60 Marks
			Total	100 Marks
			Duration of ESE: 3Hrs	

Course Objectives:

1.	Understand the complexity of Deep Learning algorithms and their limitations
2.	Learn modern notions in data analysis oriented computing
3.	Capability to confidently applying common Deep Learning algorithms in practice and implementation
4.	Be capable of performing distributed computations
5.	Able to performing experiments in Deep Learning using real-world data.

Course Contents

Unit I	Feed forward Neural networks. Gradient descent and the back propagation algorithm. Unit saturation, aka the vanishing gradient problem, and ways to mitigate it. RelU Heuristics for avoiding bad local minima. Heuristics for faster training. Nestors accelerated gradient descent. Regularization. Dropout.
Unit II	Convolutional Neural Networks Architectures, convolution / pooling layers Recurrent Neural Networks ,LSTM, GRU, Encoder Decoder architectures
Unit III	Deep Unsupervised Learning Autoencoders standard, sparse, denoising, contractive, etc), Variational Autoencoders, Adversarial Generative Networks, Autoencoder and DBM Attention and memory models, Dynamic memory networks
Unit IV	Image segmentation, object detection, automatic image captioning, Image generation with Generative adversarial networks, video to text with LSTM models. Attention models for computer vision tasks.
Unit V	Introduction to NLP and Vector Space Model of Semantics Word Vector Representations: Continuous Skip-Gram Model, Continuous Bag-of Words model (CBOW), Glove, Evaluations and Applications in word similarity, analogy reasoning

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Text Books

T.1	Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning." An MIT Press book in preparation. (2015).
T.2	Bengio, Yoshua. "Learning deep architectures for AI." Foundations and trends in Machine Learning 2.1 (2009): 1127.

Reference Books

R.1	Oquab, Maxime, et al. "Learning and transferring midlevel image representations using convolutional neural networks." Proceedings of the IEEE conference on computer vision and pattern recognition. 2014.
R.2	Bengio, Yoshua, et al. "A neural probabilistic language model." journal of machine learning research 3.Feb (2003).

Useful Links

1	https://www.youtube.com/watch?v=W3_yaf3HvHU
2	https://www.youtube.com/watch?v=aPfkYu_qiF4

	Course Outcomes	CL	Class Sessions
BIT3609.1	Understand Convolutional Neural Network	2	9
BIT3609.2	Analyze the Deep Unsupervised Learning	4	9
BIT3609.3	Implement Applications of Deep Learning to Computer Vision	3	9
BIT3609.4	Apply Applications of Deep Learning to NLP	3	9
BIT3609.5	Use of models to solve NLP problems	3	9

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Third Year (Semester-VI) B. Tech. Information Technology

BIT3610: Supply Chain Management(Program Elective-III)

Teaching Scheme			Examination Scheme	
Theory	3 Hrs/week		CT-I	15 Marks
Tutorial	-		CT-II	15 Marks
Total Credits	3		CA	10 Marks
			ESE	60 Marks
			Total	100 Marks
			Duration of ESE: 3Hrs	

Course Objectives:

1.	Student shall be able to understand the importance of Supply Chain Management (SCM).
2.	Student shall be able to understand the forecasting and role of distribution network in SCM.
3.	Student shall be able to understand inventory management in SCM.
4.	Student shall be able to understand the supplier selection in SCM.
5.	Student shall be able to understand the pattern of supply chain management

Course Contents

Unit I	The Objective, Importance of Supply Chain, Decision Phases in a Supply Chain, Drivers of Supply Chain Perforce, The Role of Distribution in the Supply Chain
Unit II	Factors Influencing Distribution Network Design, Options for a Distribution Network, The Role of Network Design in the Supply Chain, Framework and Factors Influencing Network Design Decision, Models for Facility Location and Capacity Allocation, Warehouse functions, warehousing planning and cost reduction, The Role of Forecasting in a Supply Chain , Characteristics of Forecasts, Forecasting Methods, Lean supply chain management.
Unit III	The Role of Cycle Inventory in a Supply Chain, Economies of Scale of Exploit Fixed Costs; Quantity Discounts, Managing Multi echelon Cycle Inventory, The Role of Safety Inventory in a Supply Chain
Unit IV	The Role of Transportation in a Supply Chain, Modes of Transportation and their Performance Characteristics, Transportation Infrastructure, The Role of Sourcing in a Supply Cahin; In – House or Out source, Third and Fourth – Party Logistics Providers, Supplier Scoring and Assessment, Supplier Selection. Make versus buy.

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Unit V	Nature concept Value chain, Functions and contributions, Logistics Vs Supply Chain Management, Decision Phases in a Supply chain, Organizational Structure – Achieving 35	P a g e Strategic Fit, Supply Chain Solution (3PL & 4PL), Bullwhip Effect and Supply Chain, Supply Chain Relationships.		

Text Books

T.1	Sunil Chopra & Peter Meindl , "Supply Chain Management: Strategy, Planning and Operations", Person PrenticeHall
T.2	Janat Shah, " Supply Chain Management, : Text and Cases", Person Education

Reference Books

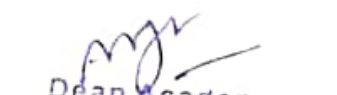| R.1	Business Logistics / Supply Chain Management, Ronald H. Ballou& Samir K. Srivastava, Person Education

Useful Links

1	https://nptel.ac.in/courses/110/106/110106045/
2	https://nptel.ac.in/courses/110/107/110107074/

	Course Outcomes	**CL**	**Class Sessions**
BIT3610.1	**Understand** importance of Supply Chain Management.	2	9
BIT3610.2	**Compile** the forecasting and role of distribution network in SCM.	3	9
BIT3610.3	**Discuss** the need and importance of inventory management in SCM.	2	9
BIT3610.4	**Outline** the supplier selection in SCM.	3	9
BIT3610.5	**Criticize** the pattern of supply chain management.	4	9

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BIT3611: Parallel Processing(Program Elective-IV

Teaching Scheme		Examination Scheme	
Theory	3 Hrs/week	CT-I	15 Marks
Tutorial	-	CT-II	15 Marks
Total Credits	3	CA	10 Marks
		ESE	60 Marks
		Total	100 Marks
		Duration of ESE: 3Hrs	

Course Objectives:

1. Will be familiar with the concepts of parallel processing and understand the particular problems arising in programming of parallel machines;

2. Familiar with the parallel computing models and the "parallel-way of thinking" required in the design of parallel algorithms;

3. Able to apply the basic algorithmic techniques and design algorithms in a shared memory as well as a distributed memory environment

4. Understand and be able to apply basic parallel programming principles in a shared/ distributed memory environment

5. Will be familiar with the concepts of parallel processing and understand the particular problems arising in programming of parallel machines;

Course Contents

Unit I	Introduction: Parallel Processing – Shared Memory Multiprocessing – Distributed Shared Memory – Message Passing Parallel Computers. Processes & Shared Memory Programming Processes - Shared Memory Programming – General Model Of Shared Memory Programming – Forking-Creating Processes – Joining Processes - Process Model Under UNIX
Unit II	Basic Parallel Programming Techniques: Loop Splitting – Ideal Speedup – Spin-Locks, Contention And Self- Scheduling. Scheduling : Loop Scheduling – Variations On Loop Scheduling – Self- Scheduling – Variations On Self-Scheduling – Indirect Scheduling – Block Scheduling
Unit III	Barriers And Race Conditions The Barrier Calls – Expression Splitting. Thread-Based Implementation Thread Management – The POSIX Thread Application Programmer Interface- Synchronization Primitives in POSIX- Example With Threads – Attributes Of Threads – Mutual Exclusion With Threads – Mutex Usage Of Threads – Thread Implementation – Events And Condition Variables – Deviation Computation With Threads – Java Threads
Unit IV	Programming Using the Message Passing Paradigm Principles of Message-Passing Programming. The Building Blocks: Send and Receive Operations. MPI: The Message Passing Interface. Topologies and Embedding. Overlapping Communication with Computation. Collective Communication and Computation Operations.

Unit V	Algorithms For Parallel Machines Models Of Computation – Analysis Of Parallel Algorithms – Prefix Computation – Histogram Computation – Parallel Reduction – Sorting Networks - Matrix Multiplication

Text Books

T.1	Introduction To Parallel Programming - By Steven Brawer.
T.2	Introduction to Parallel Computing. Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar, By Pearson Publication.

Reference Books

R.1	Introduction To Parallel Processing – By M.Sasikumar, Dinesh Shikhare And P. Ravi Prakash
R.2	Compilers Principles,Techniques & Tools. Alfred V. Aho , Ravi Sethi , Jeffrey D, Addison Wesley.

Useful Links

1	https://www.digimat.in/nptel/courses/video/106102114/L01.html
2	https://www.digimat.in/nptel/courses/video/106102163/L01.html

	Course Outcomes	CL	Class Sessions
BIT3611.1	Identify evolution of High Performance Computing (HPC) with respect to laws and the contemporary notion that involves mobility for data, hardware devices and software agents	2	9
BIT3611.2	Understand parallel and distributed algorithms in problem Solving	2	9
BIT3611.3	Interpret the impact of network topology on parallel/distributed algorithm formulations and their traffic performance.	3	9
BIT3611.4	Examine hand-on experience with the agent-based and Internet-based parallel and distributed programming techniques.	4	9
BIT3611.5	Analyze master skills to measure the performance of parallel and distributed programs.	4	9

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BIT3612: Fundamental of Convolutional Neural Networks(Program Elective-IV)

Teaching Scheme			Examination Scheme	
Theory	3 Hrs/week		CT-I	15 Marks
Tutorial	-		CT-II	15 Marks
Total Credits	3		CA	10 Marks
			ESE	60 Marks
			Total	100 Marks
			Duration of ESE: 3Hrs	

Course Objectives:

1.	Convolutional neural network (or CNN) is a special type of multilayer neural network or deep learning architecture inspired by the visual system of living beings.
2.	The CNN is very much suitable for different fields of computer vision and natural language processing.
3.	The main focus of this chapter is an elaborate discussion of all the basic components of CNN.
4.	It also gives a general view of foundation of CNN, recent advancements of CNN and some major application areas.
5.	This course covers the fundamentals from Artificial Neural Network to the current trending topic of Convolution Neural Network

Course Contents

Unit I	Biological Neuron, Idea of computational units, McCulloch–Pitts unit and Thresholding logic, Linear Perceptron, Perceptron Learning Algorithm, Linear separability. Convergence theorem for Perceptron Learning Algorithm.
Unit II	Multilayer Perceptron, Gradient Descent, Back propagation, Empirical Risk Minimization, regularization, auto encoders, Difficulty of training deep neural networks, Greedy layer wise training.
Unit III	Newer optimization methods for neural networks (Adagrad, adadelta, rmsprop, adam, NAG), second order methods for training, Saddle point problem in neural networks, Regularization methods (dropout, drop connect, batch normalization), Back propagation through time, Long Short Term Memory, Gated Recurrent Units, Bidirectional LSTMs, Bidirectional RNNs
Unit IV	Convolutional Neural Networks: LeNet, AlexNet., Generative models: Restrictive Boltzmann Machines (RBMs), Introduction to MCMC and Gibbs Sampling, gradient computations in RBMs, Deep Boltzmann Machines.

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| | | Unit V | Variational Auto encoders, Generative Adversarial Networks, Multi-task Deep Learning, Multi-view Deep Learning, Vision, NLP, Speech |

Text Books	
T.1	Deep Learning, Ian Good fellow and Yoshua Bengio and Aaron Courville, MIT Press, 2016.
Reference Books	
R.1	Neural Networks: A Systematic Introduction, Raúl Rojas, 1996
R.2	Pattern Recognition and Machine Learning, Christopher Bishop, 2007
Useful Links	
1	https://www.youtube.com/watch?v=vT1JzLTH4G4
2	https://www.youtube.com/watch?v=W3_yaf3HvHU

	Course Outcomes	CL	Class Sessions
BIT3612.1	Understand the Feed forward Networks & Deep Neural Networks	2	9
BIT3612.2	Implement Better Training of Neural Networks	3	9
BIT3612.3	Demonstrate the newer optimization method for neural network	3	9
BIT3612.4	Identify the recent trends and applications	2	9
BIT3612.5	Use different neural network methods to solve problems.	3	9

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BIT3613: Cloud Computing (Program Elective-IV)

Teaching Scheme			Examination Scheme	
Theory	3 Hrs/week		CT-I	15 Marks
Tutorial	-		CT-II	15 Marks
Total Credits	3		CA	10 Marks
			ESE	60 Marks
			Total	100 Marks
			Duration of ESE: 3Hrs	

Course Objectives:

1.	To understand the concept of cloud computing.
2.	To appreciate the evolution of cloud from the existing technologies.
3.	To have knowledge on the various issues in cloud computing.
4.	To be familiar with the lead players in cloud.
5.	To appreciate the emergence of cloud as the next generation computing paradigm.

Course Contents

Unit I	Introduction of Cloud Computing: What is Cloud Computing?, How it works?, Types of Cloud, Goals & Challenges, Leveraging Cloud Computing, Cloud Economics and Total Cost of Ownership
Unit II	Cloud Service Models Software as a Service (SaaS): Introduction, Challenges in SaaS Model, SaaS Integration Services, Advantages and Disadvantages. Infrastructure as a services (IaaS): Introduction, Virtual Machines, VM Migration Services, Advantages and Disadvantages. Platform As a service (PaaS): Introduction, Integration of Private and Public Cloud, Advantages and Disadvantages.
Unit III	Virtualization and Abstraction: What is Virtualization and how abstraction is provided in cloud? Advantages and Disadvantages, Types of Hypervisor, and Load balancing.
Unit IV	Architecting on AWS Introduction to System Design: AWS Essentials Review and System Design for High Availability, Automation and Serverless Architectures: Event-Driven Scaling, Well-Architected Best Practices: Security, Reliability, Performance Efficiency, Cost Optimization and Deployment and Implementation: Design Patterns and Sample Architectures
Unit V	Cloud Security Tools and technologies to secure the data in Private and Public Cloud Architecture. Security Concerns, Legal issues and Aspects, Multi-tenancy issues.

Text Books

T.1	Judith Hurwitz, R Bloor, M.Kanfman, F.Halper "Cloud Computing for Dummies", Wiley India Edition, First Edition
T.2	Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, "Cloud Computing: Principles and Paradigms", Wiley Publication,2011

Reference Books

R.1	Tim Mather, SubraKumara swamy, Shahed Latif, "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance", O'ReillyMedia Inc, 2009
R.2	Mickey Iqbal 2010, " IT Virtualization Best Practices: A Lean, Green Virtualized Data Center Approach", MC Press

Useful Links

1	https://www.youtube.com/watch?v=SBY-YIHRTZ0
2	https://www.youtube.com/watch?v=A3FPxuKInkU

	Course Outcomes	CL	Class Sessions
BIT3613.1	Understand and analyze the architecture of Cloud (Analyze).	2	9
BIT3613.2	Identify and apply deployment and management options of AWS Cloud Architecture	3	9
BIT36133	Design architectures to decouple infrastructure and reduce interdependencies	6	9
BIT36134	Formulate policy based scenarios in Cloud simulators	6	9
BIT3613.5	Use and apply cloud security tools	3	9

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BIT3614: Human Computer Interface (Program Elective-IV)

Teaching Scheme			Examination Scheme	
Theory	3 Hrs/week		CT-I	15 Marks
Tutorial	-		CT-II	15 Marks
Total Credits	3		CA	10 Marks
			ESE	60 Marks
			Total	100 Marks
			Duration of ESE: 3Hrs	

Course Objectives:

1.	Describe and apply user-centered design methods to conduct formative and summative evaluations.
2.	Explain and apply core theories and models from the field of HCI.
3.	Design and implement useful, usable, and engaging graphical computer interfaces.
4.	Discuss and critique research in the field of HCI.
5.	Describe special considerations in designing user interfaces for wellness.

Course Contents

Unit I	Importance of User Interface, History of Human Computer Interface, Importance of Good Design, Benefits of Good Design, Principles of User Interface Design.
Unit II	Keyboard Keys, Function Keys, Pointing Devices, Speech Recognition, Handwriting Recognition, Speech Generation, Image Display, Video Display, Device Drivers.
Unit III	Why Colors, Color Uses, Choosing Colors, Possible Problems With Colors, Page Title, Headings, Text, Messages, Error Messages, Icons, Understanding How User Interact With Computers, User Interface Models, Design Methodologies, Designing an Interface, Process of Interaction Design.
Unit IV	Human Interaction with Computers, Human Interaction Speeds, Human Characteristics in Design, Human Consideration in Design, Popularity of Graphics, Characteristics of Graphical User Interface, Concepts of Direct Manipulation, Graphical System Advantages and Disadvantages, Web User Interface Characteristics and Popularity.
Unit V	Device Based Controls, Operable Controls, Text Entry/Read-Only Controls, Selection Controls, Combining Entry/Selection Controls, Other Operable Controls, Presentation Controls and Selecting Proper Controls, Usability and Prototypes Usability: Purpose of Usability, Importance of Usability, Usability Testing.

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Text Books

T.1	Human Computer Interaction - brief intro By John M. Carroll
T.2	Readings in Computers and Human Interaction: Toward the Year 2000, 2nd edition Ronald M. Baecker, Jonathan Grudin, William A. S. Buxton & Saul Greenberg (eds)

Reference Books

R.1	Human-Computer Interaction. Alan Dix, Janet Finlay, Gregory Abowd & Russell Beale.
R.2	Principles and Guidelines in Software User Interface Design Mayhew, Deborah J.

Useful Links

1	https://www.digimat.in/nptel/courses/video/106106177/L01.html
2	https://www.digimat.in/nptel/courses/video/106106177/L15.html

	Course Outcomes	CL	Class Sessions
BIT3614.1	Understand fundamental design and evaluation methodologies of human computer interaction.	2	9
BIT3614.2	Demonstrate knowledge of human computer interaction design concepts and related methodologies.	3	9
BIT3614.3	Examine theories and concepts associated with effective work design to real-world application.	4	9
BIT3614.4	Evaluate and design usable and appropriate software based on psychological, social, and technical analysis	5	9
BIT3614.5	Apply user-centered design methods to conduct formative and summative evaluations.	3	9

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BIT3615: Engineering Economics & Management

Teaching Scheme			Examination Scheme	
Theory	3 Hrs/week		CT-I	15 Marks
Tutorial	-		CT-II	15 Marks
Total Credits	3		CA	10 Marks
			ESE	60 Marks
			Total	100 Marks
			Duration of ESE: 3Hrs	

Course Objectives:

1.	To know the students about basic concept of economics.
2.	To know the students about functions of various banks, types of taxes, advantages /Disadvantages of Various taxes, inflation, deflation.
3.	To get the knowledge of marketing & financial management.
4.	To introduce concepts of share market & planning of management.
5.	To apply concepts of marketing in real world.

Course Contents

Unit I	**Theory of Demand & Utility**: Law of Demand. Types of Demand, Elasticity of demand, methods of measurement of elasticity of demand, law of diminishing marginal utility, factorsof production.
Unit II	**Price Determination & depreciation**: Laws of return, Average cost, Marginal cost, fixed cost, variable cost, perfect competition. Imperfect competition (monopoly, oligopoly, monopolistic competition), Depreciation, Methods to calculate depreciation
Unit III	**Functions of Banks, Taxation & Economic Policy**: Banks, Functions of Central & Commercial Banks, Inflation, Deflation, Stagflation, Direct and Indirect Taxes, Globalization, Liberalization business cycles.
Unit IV	**Functions of Management & Share market**: Nature & Scope of management, functions of management-planning, organizing, directing, Controlling & Communicating. **Share Market**: Concept & overview of share market, Effect of Share market on Economy, share market Terminology.
Unit V	**Marketing & Financial Management:** Marketing Mix, channels of distribution, advertising and sales promotion, objectives of financial marketing, balance sheet, profit and loss account, budget and their importance.

Text Books

T.1	O.P. Khanna, "Industrial Engineering and Management", Dhanpat Rai & sons,1998
T.2	R.Panner Selvam, "Production and Operations Management", PHI Learning, 2002

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	Reference / Useful Links			
T.3	Mart and Telsang, "Industrial Engineering and Production Management", S.Chand and Co., 1998			

Reference Books

R.1	Shailendra Kale, "Production and Operations Management", McGraw Hill, India 2013

Useful Links

1	https://nptel.ac.in/courses/112107209
2	https://www.youtube.com/watch?v=RaXQ8wQ6TUs

	Course Outcomes	CL	Class Sessions
BIT3615.1	Describe demand & utility of product in industries.	2	9
BIT3615.2	Discuss the terms Price determinations and depreciation.	2	9
BIT3607.3	Explain the functions of banks, taxations & economic policies.	2	9
BIT3615.4	Apply the planning, organizing, direction, controlling & Communication strategies for proper management in industries.	3	9
BIT3615.5	Examine the skill of finance & marketing management in entrepreneurship.	4	9

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BAU3606 : Social Awareness

Teaching Scheme			Examination Scheme	
Lectures	2 Hrs/week		CIE	-
Tutorial	0 Hrs/week		ESE	-
Total Credits	Audit		Total	-

Course Activity:

1. Social awareness (Artisans-relates to engineering., visit to hospitals, orphanages, police station, courts, trauma centers, consumer forums)
2. Social Service (teach in neighborhood, adopt an underprivileged school, village stay/visit (NSS), cleanliness drive, and skill transfer)

Course Contents	Hours
Human beings live in relationship with their family members and with others in the society. As a society, mankind strives to achieve ordered and organized life through which an environment of cooperation and coexistence is expected. A healthy society creating an environment of fearlessness is a key for the mankind to achieve higher goals because it is society which makes us most human, most complete as people. Although as a society, our expectation is fearlessness, but due to lack of understanding of our role in a society, we fail to fulfill the expectation. The social awareness activity shall promote an understanding and sharing of issues of societal problem through exposure to variety of artisans and different kind of organizations. It is expected that this exposure will enable the learners to appreciate social issues, problems and challenges. Each institution will offer a range of introductory activity based courses focusing on local artisans related to engineering so that students are sensitized to appreciate their problem and can take up some of the problem to solve while they do their regular studies. This course shall also reached visits to hospitals, orphanages, police station, courts, trauma centers consumer forums so that they get exposed to different facets of societal problems. Care should be taken to give adequate representation the local and regional organizations and artisans. For example, Banaras has local traditions in Banarasi Saan. Toy making, etc and has almost all types of organizations. An institution in Basaras area can offer courses on these artisans. This will, in turn, also ensure wider community involvement interaction with the institution. At the end of the course semester, a student should be able to identify a social issue, prepare project report and give presentation on the selected issues, Contact hours per mock should be 3-4 hours. Towards the end of the course the institution can organize an exhibition in which all the students publicly demonstrate findings of their reports and their future plans of acts.	(08)