

AC-12/10/2023

Item No-5.169



**Rayat Shikshan Sanstha's
KARMAVEER BHURAO PATIL COLLEGE, VASHI.
NAVI MUMBAI
(AUTONOMOUS COLLEGE)
Sector-15- A, Vashi, Navi Mumbai - 400 703**

Syllabus for T.Y.B.Sc Information Technology

Program: B.Sc. Information Technology

Course: T.Y.B.Sc Information Technology

**(Choice Based Credit, Grading and Semester System with
effect from the academic year 2023-2024)**

Karmaveer Bhaurao Patil College Vashi, Navi Mumbai

Autonomous College

[University of Mumbai]

Syllabus

Sr. No.	Heading	Particulars
1	Title of Course	T.Y.B.Sc. Information Technology
2	Eligibility for Admission	12th Maths
3	Passing Marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Years/Semesters	One year/Two semester
6	Level	U.G.
7	Pattern	Semester
8	Status	Revised
9	To be implemented from Academic year	2023-2024

Preamble of the Syllabus:

The B.Sc. Information Technology programme was started in 2001 with an aim to make the students employable and impart industry oriented training. The main objectives of the course are:

- To think analytically, creatively and critically in developing robust, extensible and highly maintainable technological solutions to simple and complex problems.
- To apply their knowledge and skills to be employed and excel in IT professional careers and/or to continue their education in IT and/or related post graduate programmes.
- To be capable of managing complex IT projects with consideration of the human, financial and environmental factors.

- To work effectively as a part of a team to achieve a common stated goal.
- To adhere to the highest standards of ethics, including relevant industry and organizational codes of conduct.
- To communicate effectively with a range of audiences both technical and non-technical.
- To develop an aptitude to engage in continuing professional development. The new syllabus is aimed to achieve the objectives. The syllabus spanning three years covers the industry relevant courses. The students will be ready for the jobs available in different fields like:
 - Software Development (Programming)
 - Website Development
 - Mobile app development
 - Embedded Systems Development & Programming
 - Software Testing
 - Networking
 - Database Administration
 - System Administration
 - Cyber Law Consultant

- GIS (Geographic Information Systems)

- IT Service Desk

- Security

And many others

The students will also be trained in communication skills and green computing

Scheme of examination for Each Semester:

Continuous Internal Evaluation: 40 Marks (Common Test-20 Marks & 20 Marks for- Assignment, Projects, Group discussion, Open book test, online test etc.)

Semester End Examination: 60 Marks will be as follows -

I.	Theory: The Semester End Examination for theory course work will be conducted as per the following scheme.	
	Each theory paper shall be of two and half hour duration.	
	All questions are compulsory and will have internal options.	
	Q – I	From Unit – I (having internal options.) 10 M
	Q – II	From Unit – II (having internal options.) 10 M
	Q – III	From Unit – III (having internal options.) 10 M
	Q – IV	From Unit – IV (having internal options.) 10 M
	Q-V	From Unit – V (having internal options.) 10 M
Q-VI	From Unit – VI (having internal options.) 10 M	
II.	Practical	The Semester End Examination for practical course work will be conducted as per the following scheme.
Sr. No.	Particulars of Semester End Practical Examination	Marks%
1	Laboratory Work	40
2	Journal	05
3	Viva	05
	TOTAL	50

Semester – V

Course Code	Course Type	Course Title	Credits	Course Code	Course Title	Credits	Total Credit	Total
UGIT501	CORE COURSE	Software Project Management	4	UGIT5P1	Software Project Management Practical	2	6	24
UGIT502	CORE COURSE	Computer Networks	4	UGIT5P2	Computer Networks Practical	2	6	
UGIT503A OR UGIT503B	Elective: Discipline Specific DSE	Internet of Things OR Data Science	4	UGIT5P3A OR UGIT5P3B	Internet of Things Practical OR Data Science Practical	2	6	
UGIT504A OR UGIT504B	Elective: Discipline Specific DSE	Advanced Web Programming OR Data analysis and visualization	4	UGIT5P4A OR UGIT5P4B	Advanced Web Programming Practical OR Data analysis and Visualization Practical	2	6	

Semester – VI

Course Code	Course Type	Course Title	Credits	Cours Code	Course Title	Credits	Total Credits	Total
UGIT601	CORE COURSE	Software Quality Assurance	4	UGIT6P1	Software Quality Assurance Practical	2	6	24
UGIT602	CORE COURSE	Project	4	UGIT6P2	Project Practical	2	6	
UGIT603A OR UGIT603B	Elective: Discipline Specific DSE	Cyber Laws OR Business Intelligence	4	UGIT6P3A OR UGIT6P3B	Cyber Laws Practical OR Business Intelligence Practical	2	6	
UGIT604A OR UGIT604B	Elective: Discipline Specific DSE	Security in Computing OR Principles of Geographic Information Systems	4	UGIT6P4A OR UGIT6P4B	Security in Computing Practical OR Principles of Geographic Information Systems Practical	2	6	

Rayat Shikshan Sanstha's
Karmaveer Bhaurao Patil College, Vashi
Navi Mumbai
(Autonomous)
Department of Information Technology
B.Sc. Information Technology

Program Outcomes (POs)

Learners are able to-		
PO-1	Disciplinary Knowledge and Skills	Acquire the comprehensive and in-depth knowledge of various subjects in sciences such as Physics, Chemistry, Mathematics, Microbiology, Bio-analytical Science, Computer Science, Data Science, Information Technology and disciplinary skills and ability to apply these skills in the field of science, technology, and its allied branches
PO-2	Communication and Presentation Skills	Develop various communication skills including presentation to express ideas evidently to achieve common goals of the organization.
PO-3	Creativity and Critical Judgment	Facilitate solutions to current issues based on investigations, evaluation and justification using evidence-based approach.
PO-4	Analytical Reasoning and Problem Solving	Build critical and analytical attitude in handling the problems and situations.
PO-5	Sense of Inquiry	Curiously raise relevant questions based on highly developed ideas, scientific theories and its applications including research.
PO-6	Use of Digital Technologies	Use various digital technologies to explore information/data for business, scientific research, and related purposes.
PO-7	Research Skills	Construct, collect, investigate, evaluate, and interpret information/data relevant to science and technology to adapt, evolve and shape the future.
PO-8	Application of Knowledge	Develop a scientific outlook to create consciousness against the social myths and blind faith.
PO-9	Moral and Ethical Reasoning	Imbibe ethical, moral, and social values to develop virtues such as justice, generosity, and charity as beneficial to individuals and society at large.
PO-10	Leadership and Teamwork	Work cooperatively and lead proactively to achieve the goals of the organization by implementing the plans and projects in various field-based situations related to science, technology, and society at large.
PO-11	Environment and Sustainability	Create social awareness about the environment and develop sustainability for betterment of the future.
PO-12	Lifelong Learning	Realize that pursuit of knowledge is a lifelong activity and in combination with determined efforts, positive attitude and other qualities to lead a successful life.

Department of Information Technology
Program Specific Outcomes (PSO)

PSO-1	To acquaint students with the fundamental of computer hardware and software in information technology
PSO-2	To develop analytical skills and critical thinking through application of theory knowledge into practical course
PSO-3	To construct and apply knowledge of programming, and appreciate the relationship between several programming languages and other disciplines
PSO-4	To enable students to understand IT and its industrial and social context

Semester – V

B.Sc (Information Technology)		Semester – V	
Course Name: Software Project Management		Course Code: UGIT501	
Periods per week (1 Period is 50 minutes)		5	
Credits		2	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Internal	--	40

UGIT501 Software Project Management

Course Outcomes: After successful completion of this course, students will be able to:

CO-1: Understand the role of SDLC in software development.

CO-2:Analyze the exclusive needs and requirements of the client.

CO-3:Create procedures for the development and implementation process.

CO-4:Design a model to convert client requirements into a design model.

CO-5:Assess project goals and estimate time required for achievement.

ICT Tools Used: Videos, PPT, Pen-Table, Turbo C

Students Centric Methods: Problem Solving and Participative

(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

1) <https://www.udemy.com/share/106IN4/>

The CO-PO Mapping Matrix

CO/P O	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	1	2	-	-	-	-
CO3	1	-	-	-	-	-	-	1	-	-	-	2
CO4	2	-	-	-	-	-	-	2	-	-	-	1
CO5	2	-	-	-	-	-	-	-	-	-	-	-

Unit	Details	Lectures
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<p style="text-align: center;">I</p>	<p>Introduction to Software Project Management: Introduction, Why is Software Project Management Important? What is a Project? Software Projects versus Other Types of Project, Contract Management and Technical Project Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some Ways of Categorizing Software Projects, Project Charter, Stakeholders, Setting Objectives, The Business Case, Project Success and Failure, What is Management? Management Control, Project Management Life Cycle, Traditional versus Modern Project Management Practices.</p> <p>Project Evaluation and Programme Management : Introduction, Business Case, Project Portfolio Management, Evaluation of Individual Projects, Cost benefit Evaluation Techniques, Risk Evaluation ,Programme Management, Managing the Allocation of Resources with in Programmes Strategic Programme Management,</p>	<p style="text-align: center;">10</p>
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	<p>Creating A Programme, Aids to Programme Management, Some Reservations about Programme Management, Benefits Management.</p> <p>An Overview of Project Planning :Introduction to Step Wise Project Planning,Step0:Select Project,Step1:Identify Project Scope and Objectives,Step2: Identify Project Infrastructure,Step3:Analyze Project Characteristics, Step 4: Identify Project Products and Activities,Step5:Estimate Effort for Each Activity,Step6:Identify Activity Risks, Step 7: Allocate Resources, Step 8: Review/Publicize Plan, Steps 9 and10:Execute Plan/Lower Levels of Planning</p>	
II	<p>Selection of an Appropriate Project Approach: Introduction, Build or Buy? Choosing Methodologies and Technologies ,Software Processes and Process Models, Choice of Process Models, Structure versus Speed of Delivery, The Waterfall Model, The Spiral Model, Software Prototyping, Other Ways of Categorizing Prototypes, Incremental Delivery, A tern/Dynamic Systems Development Method, Rapid Application Development, Agile Methods, Extreme Programming (XP), Scrum, Lean Software Development, Managing Iterative Processes, Selecting the Most Appropriate Process Model.</p> <p>Software Effort Estimation: Introduction, Where are the Estimates Done? Problems with Over- and Under-Estimates, The Basis for Software Estimating, Software Effort Estimation Techniques, Bottom-up Estimating, The Top-down Approach and Parametric Models, Expert Judgment, Estimating by Analogy, Albrecht Function Point</p>	10
III	<p>Activity Planning : Introduction, Objectives of Activity Planning, When to Plan, Project Schedules, Project sand Activities, Sequencing and Scheduling Activities, Network Planning Models, Formulating a Network Model, Adding the Time Dimension, The Forward Pass, Backward Pass, Identifying the Critical Path, Activity Float, Shortening the Project Duration, Identifying Critical Activities, Activity-on- Arrow Networks.</p> <p>Risk Management: Introduction, Risk, Categories of Risk, Risk Management Approaches, A Framework for Dealing with Risk, Risk Identification, Risk Assessment, Risk Planning, Risk Management, Evaluating Risks to the Schedule, Boehm’s Top 10 Risks and Countermeasures, Applying the PERT Technique, Monte Carlo Simulation, Critical Chain Concepts.</p> <p>Resource Allocation: Introduction, Nature of Resources, Identifying Resource Requirements, Scheduling Resources, Creating Critical Paths, Counting the Cost, Being Specific, Publishing the Resource Schedule, Cost Schedules, Scheduling Sequence.</p>	10
IV	<p>Monitoring and Control: Introduction, Creating the Framework, Collecting the Data, Review, Visualizing Progress, Cost Monitoring, Earned Value Analysis, Prioritizing Monitoring, Getting the Project Back to Target, Change Control, Software Configuration Management(SCM).</p> <p>Managing Contracts: Introduction, Types of Contract, Stages in Contract Placement, Typical Terms of a Contract ,Contract Management, Acceptance.</p>	10
V	<p>Managing People in Software Environments: Introduction, Understanding Behavior, Organizational Behavior : A Background, Selecting the Right Person for</p>	10

	<p>the Job, Instruction in the Best Methods, Motivation, The Oldham–Hackman Job Characteristics Model, Stress, Stress Management, Health and Safety, Some Ethical and Professional Concerns.</p> <p>Working in Teams : Introduction, becoming a Team, Decision Making, Organization and Team Structures, Coordination Dependencies,</p>	
VI	<p>Software Quality: Introduction, The Place of Software Quality in Project Planning, Importance of Software Quality, Defining Software Quality, Software Quality Models, ISO 9126, Product And Process Metrics, Product versus Process Quality Management, Quality Management Systems, Process Capability Models, Techniques to Help Enhance Software Quality, Testing, Software Reliability, Quality Plans.</p> <p>Project Close out: Introduction, Reasons for Project Closure, Project Closure Process, Performing a Financial Closure, Project Close out Report</p>	10

Books and References:

Title	Author/s	Edition	Publisher
Software Project Management	Bob Hughes, Mike Cotterell, Rajib Mall	TMH	6th
Project Management and Tools & Technologies –An overview	Shailesh Mehta	SPD	1st
Software Project Management	Walker Royce	Pearson	

B. Sc (Information Technology)		Semester – V	
Course Name: Software Project Management Practical		Course Code: UGIT5P1	
Periods per week (1 Period is 50 minutes)		4	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

UGIT5P1 Software Project Management

Course Outcomes: After successful completion of this course, students will be able to:

CO-1: Understand the unique demands and specifications of the customer.

CO-2: Analyze the requirements to create effective procedures.

CO-3: Design procedures tailored to fulfill customer demands and specifications.

ICT Tools Used: Videos, PPT, Pen-Table, Turbo C

Students Centric Methods: Problem Solving and Participative

(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

1) <https://www.udemy.com/share/106IN4/>

The CO-PO Mapping Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	1	2	-	-	-	-
CO3	2	-	-	-	-	-	-	1	-	-	-	1

List of Practicals:

Practical No	Details
1	Study and implementation of class diagrams.
2	Study and implementation of Use Case Diagrams.
3	Study and implementation of Entity Relationship Diagrams.

4	Studyand implementation of Sequence Diagrams.
5	Studyand implementation of State Transition Diagrams.
6	Studyand implementation of Data Flow Diagrams.
7	Studyand implementation of Collaboration Diagrams.
8	Studyand implementation of Activity Diagrams.
9	Studyand implementation of Component Diagrams.
10	Studyand implementation of Deployment Diagram

Unit	Details	Lectures
I	<p>Introduction: Data communications, networks, network types, Internet history, standards and administration.</p> <p>Network Models: Protocol layering, TCP/IP protocol suite, The OSI model.</p> <p>Introduction to Physical layer: Data and signals, periodic analog signals, digital signals, transmission impairment, data rate limits, performance.</p>	10
II	<p>Digital and Analog transmission: Digital-to-digital conversion, Analog -to- digital conversion, transmission modes, digital-to-analog conversion, analog-to-analog conversion.</p> <p>Bandwidth Utilization: Multiplexing and Spectrum Spreading: Multiplexing, Spread Spectrum</p> <p>Transmission media: Guided Media, Unguided Media</p> <p>Switching: Introduction, circuits with networks, packet switching, structure of a switch.</p>	10
III	<p>Introduction to the Data Link Layer: Link layer addressing, Data Link Layer Design Issues, Error detection and correction, block coding, cyclic codes, checksum, forward error correction, error correcting codes, error detecting codes.</p> <p>Data Link Control: DLC services, data link layer protocols, HDLC, Point-to-point protocol.</p> <p>Media Access Control: Random access, controlled access, channelization, Wired LANs–Ethernet Protocol, standard Ethernet , fast Ethernet , gigabit Ethernet , 10 gigabit Ethernet .</p>	10
IV	<p>Wireless LANs: Introduction, IEEE 802.11 project, Bluetooth, Wi MAX, Cellular telephony, Satellite networks.</p> <p>Connecting devices and Virtual LANs.</p> <p>Introduction to the Network Layer: Network layer services, packet switching, network layer performance, IPv4 addressing, forwarding of IP packets, Internet Protocol, ICMPv4, Mobile IP</p>	10
V	<p>Unicast Routing: Introduction, routing algorithms, unicast routing protocols.</p> <p>Next generation: IPv6 addressing, IPv6 protocol, ICMPv6 protocol, transition from IPv4 to IPv6.</p>	10
VI	<p>Introduction to the Transport Layer: Introduction, Transport layer protocols (Simple protocol, Stop-and-wait protocol, Go-Back-n protocol, Selective repeat protocol, Bidirectional protocols), Transport</p>	10

Books and References:

Title	Author/s	Edition	Publisher
Data Communication and Networking	Behrouz A .Forouzan	Fifth Edition	TataMcGrawHill
TCP/IP ProtocolSuite	Behrouz A. Forouzan	Fourth Edition	TataMcGraw Hill
Computer Networks Andrew Tanenbaum	Pearson Fifth2013		

B.Sc (Information Technology)		Semester – V	
Course Name: Computer Networks Practical		Course Code: UGIT5P2	
Periods per week (1 Period is 50 minutes)		4	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

UGIT5P2 Computer Networks

Course Outcomes: After successful completion of this course, students will be able to:

CO1: Explain the roles played by the TCP/IP and OSI models' various layers.

CO2: Describe the roles played by the paradigms and protocols of the Application and Presentation layers.

CO3: Explain the problems with session layer design and transport layer functionality.

ICT Tools Used: Videos, PPT, Packet Tracer

Students Centric Methods: Problem Solving and Participative (Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

<https://www.coursera.org/specializations/computer-communications>

<https://www.udemy.com/course/computer-network-system-foundations/>

https://onlinecourses.swayam2.ac.in/cec19_cs07/preview

The CO-PO Mapping Matrix

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	1	-	-	-	-	-	-	-
CO2	1	-	-	-	-	-	-	2	-	-	-	-
CO3	1	-	-	-	-	-	2	1	-	-	-	-

List of Practical:

Practical No	Details
1	IPv4 Addressing and Subnetting a) Given an IP address and network mask, determine other information about the IP address such as: <ul style="list-style-type: none">• Network address• Network broadcast address• Total number of host bits• Number of hosts b) Given an IP address and network mask, determine other information about the IP address such as: <ul style="list-style-type: none">• The subnet address of this subnet• The broadcast address of this subnet• The range of host addresses for this subnet• The Maximum Number Of Subnets For This Subnet Mask• The Number Of Hosts For Each Subnet• The Number Of Subnet Bits The Number Of This Subnet
2	Use of ping and tracert/traceroute, ipconfig/ifconfig, route and arp utilities.
3	Configure IP static routing.
4	Configure IP routing using RIP.
5	Configuring Simple OSPF.
6	Configuring DHCP server and client.
7	Create Virtual PC based networks using virtualization software and virtual NIC.

8	Configuring DNS Server and client.
9	Configuring OSPF with multiple areas.
10	Use of Wireshark to scan and check the packet information of following protocols <ul style="list-style-type: none"> • HTTP • ICMP • TCP • SMTP • POP3

B. Sc (Information Technology)		Semester – V	
Course Name: Internet Of Things		Course Code: UGIT503A	
Periods per week (1 Period is 50 minutes)		4	
Credits		4	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Internal	--	40

UGIT 503A Internet of Things

Course Outcomes: After successful completion of this course, students will be able to:

CO1: Provide an understanding of the technologies and the standards relating to the Internet of Things.

CO2: Assess the vision and introduction of IoT

CO3: Understand IoT Market perspective.

CO4: Implement Data and Knowledge Management and use of Devices in IoT Technology

CO5: understand State of the Art - IoT Architecture.

ICT Tools Used: Videos, PPT, Arduino,Flutter,Kinoma,Tessel 2,M2MLabs

Mainspring Raspberry Pi OS (ex. Raspbian),Node-RED

Students Centric Methods: Problem Solving and Participative (Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

<https://www.coursera.org/specializations/iot>

<https://www.udemy.com/course/complete-guide-to-build-iot-things-from-scratch-to-market/>

https://onlinecourses.nptel.ac.in/noc22_cs53/preview

The CO-PO Mapping Matrix

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	-	-	-	-	-	1
CO2	2	-	-	-	-	1	-	-	-	-	-	-
CO3	-	-	2	-	-	2	1	1	-	-	-	1
CO4	-	-	-	-	2	3	-	-	-	-	2	-
CO5	2	-	-	-	-	-	-	1	-	-	-	2

Unit	Details	Lectures
I	<p>The Internet of Things: An Overview : The Flavor of the Internet of Things, The “Internet” of “Things”, The Technology of the Internet of Things, Enchanted Objects, Who is Making the Internet of Things?</p> <p>Design Principles for Connected Devices: Calm and Ambient Technology, Magic as Metaphor, Privacy, Keeping Secrets, Whose Data Is It Anyway? Web Thinking for Connected Devices, Small Pieces, Loosely Joined, First-Class Citizens On The Internet, Graceful Degradation, Affordances.</p>	10
II	<p>Internet Principles: Internet Communications: An Overview, IP, TCP, UDP, IP Addresses, DNS, Static IP Address Assignment, Dynamic IP Address Assignment, IPv6, MAC Addresses, TCP and UDP Ports, An Example: HTTP Ports, Other Common Ports, Application Layer Protocols, HTTP, HTTPS: Encrypted HTTP, Other Application Layer Protocols.</p> <p>Thinking About Prototyping: Sketching, Familiarity, Costs versus Ease of Prototyping, Prototypes and Production, Changing Embedded Platform, Physical Prototypes and Mass Personalisation, Climbing into the Cloud, Open Source versus Closed Source, Why Closed? Why Open? Mixing Open and Closed Source, Closed Source for Mass Market Projects, Tapping into the Community.</p>	10
III	<p>Prototyping Embedded Devices: Electronics, Sensors, Actuators, Scaling Up the Electronics, Embedded Computing Basics, Microcontrollers, System-on-Chips, Choosing Your Platform, Arduino, Developing on the Arduino, Some Notes on the Hardware, Openness, Raspberry Pi, Cases and Extension Boards, Developing on the Raspberry Pi, Some Notes on the Hardware, Openness.</p>	10
IV	<p>Prototyping the Physical Design: Preparation, Sketch, Iterate, and Explore, Non Digital Methods, Laser Cutting, Choosing a Laser Cutter, Software, Hinges and Joints, 3D Printing, Types of 3D Printing, Software, CNC Milling, Repurposing/Recycling.</p> <p>Prototyping Online Components: Getting Started with an API, Mashing Up APIs, Scraping, Legalities, Writing a New API, Clockodillo, Security,</p>	10

	Implementing the API, Using Curl to Test, Going Further, Real-Time Reactions, Polling, Comet, Other Protocols, MQ Telemetry Transport, Extensible Messaging and Presence Protocol, Constrained Application Protocol.	
V	<p>Techniques for Writing Embedded Code: Memory Management, Types of Memory, Making the Most of Your RAM, Performance and Battery Life, Libraries, Debugging.</p> <p>Business Models: A Short History of Business Models, Space and Time, From Craft to Mass Production, The Long Tail of the Internet, Learning from History, The Business Model Canvas, Who Is the Business Model For? Models, Make Thing, Sell Thing, Subscriptions, Customisation, Be a Key Resource, Provide Infrastructure: Sensor Networks, Take a Percentage, Funding an Internet of Things Startup, Hobby Projects and Open Source, Venture Capital, Government Funding, Crowdfunding, Lean Startups.</p>	10
VI	<p>Moving to Manufacture: What Are You Producing? Designing Kits, Designing Printed circuit boards, Software Choices, The Design Process, Manufacturing Printed Circuit Boards, Etching Boards, Milling Boards. Assembly, Testing, Mass-Producing the Case and Other Fixtures, Certification, Costs, Scaling Up Software, Deployment, Correctness and Maintainability, Security, Performance, User Community.</p> <p>Ethics: Characterizing the Internet of Things, Privacy, Control, Disrupting Control, Crowdsourcing, Environment, Physical Thing, Electronics, Internet Service, Solutions, The Internet of Things as Part of the Solution, Cautious Optimism, The Open Internet of Things Definition.</p>	10

Books and References:

Title	Author/s	Edition	Publisher	Year
Designing the Internet of Things	Adrian McEwen, Hakim Cassimally	WILEY	First	2014
Internet of Things – Architecture and Design	Raj Kamal	McGraw Hill	First	2017
Getting Started with the Internet of Things	Cuno Pfister	O'Reilly	Sixth	2018
Getting Started with Raspberry Pi	Matt Richardson and Shawn Wallace	SPD	Third	2016

B. Sc (Information Technology)		Semester – V	
Course Name: Internet of Things Practical		Course Code: UGIT5P3A	
Periods per week (1 Period is 50 minutes)		4	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

UGIT 5P3A Internet of Things

Course Outcomes: After successful completion of this course, students will be able to:

CO1: Describe the standards and technologies associated with the Internet of Things.

CO2: Evaluate the IoT's debut and vision

CO3: Recognize the viewpoint of the IoT market.

ICT Tools Used: Videos, PPT, Arduino,Flutter,Kinoma,Tessel 2,M2MLabs
Mainspring Raspberry Pi OS (ex. Raspbian),Node-RED

Students Centric Methods: Problem Solving and Participative
(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

<https://www.coursera.org/specializations/iot>

<https://www.udemy.com/course/complete-guide-to-build-iot-things-from-scratch-to-market/>

https://onlinecourses.nptel.ac.in/noc22_cs53/preview

The CO-PO Mapping Matrix

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	-	-	-	-	-	-
CO2	2	-	-	-	-	1	-	-	-	-	-	-
CO3	-	-	-	-	-	2	1	1	-	-	-	1

List of Practicals:

Practical No	Details
0	Starting Raspbian OS, Familiarising with Raspberry Pi Components and interface, Connecting to ethernet, Monitor, USB.
1	Displaying different LED patterns with Raspberry Pi.
2	Displaying Time over 4-Digit 7-Segment Display using Raspberry Pi
3	Raspberry Pi Based Oscilloscope
4	Controlling Raspberry Pi with WhatsApp.

5	Setting up Wireless Access Point using Raspberry Pi
6	Fingerprint Sensor interfacing with Raspberry Pi
7	Raspberry Pi GPS Module Interfacing
8	IoT based Web Controlled Home Automation using Raspberry Pi
9	Visitor Monitoring with Raspberry Pi and Pi Camera
10	Interfacing Raspberry Pi with RFID.
11	Building Google Assistant with Raspberry Pi.
12	Installing Windows 10 IoT Core on Raspberry Pi

Course Name: Data Science		Course Code: UGIT503B	
Periods per week (1 Period is 50 minutes)		4	
Credits		4	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Internal	--	40

PGIT503B Data Science

Course Outcomes: After successful completion of this course, students will be able to:

CO1: Apply quantitative modeling and data analysis techniques to the solution of real world business problems, communicate findings, and effectively present results using data visualization techniques

CO2: Recognize and analyze ethical issues in business related to intellectual property, data security, integrity, and privacy.

CO3: Apply ethical practices in everyday business activities and make well-reasoned ethical business and data management decisions.

CO4: Demonstrate knowledge of statistical data analysis techniques utilized in business decision making.

CO5: Apply principles of Data Science to the analysis of business problems.

ICT Tools Used: Videos, PPT, Python

Students Centric Methods: Problem Solving and Participative (Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

- https://onlinecourses.nptel.ac.in/noc21_cs69/preview
- <https://www.udemy.com/course/python-for-data-science-and-machine-learning-bootcamp/>
- <https://www.coursera.org/professional-certificates/ibm-data-science>

The CO-PO Mapping Matrix

COP	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	1	-	2	2	-	-	-	-	-	-	2	-
CO2	-	-	-	2	-	-	-	-	3	-	-	2
CO3	-	-	-	-	-	-	-	2	3	-	-	-
CO4	-	2	-	-	-	-	-	2	-	-	-	1
CO5	-	-	-	2	-	-	-	3	-	-	-	-

Unit	Details	Lectures
I	Introduction to Data Science: What is Data? Different kinds of data Introduction to high level programming language + Integrated Development Environment (IDE), Exploratory Data Analysis (EDA) + Data Visualization, Different types of data sources.	10
II	Data Management: Data Collection, Data cleaning/extraction, Data analysis & .Modeling Data transformations: Dimension reduction, Feature extraction, Smoothing and aggregating	10

III	Statistical Modelling and Machine Learning: Introduction to model selection: Regularization, bias/variance trade-off e.g. parsimony, AIC, BIC, Cross validation, Ridge regressions and penalized regression e.g. LASSO	10
IV	Data Curation: Query languages and Operations to specify and transform data, Structured/schema based systems as users and acquirers of data Semi-structured systems as users and acquirers of data, Unstructured systems in the acquisition and structuring of data, Security and ethical considerations in relation to authenticating and authorizing access to data on remote systems, Software development tools, Large scale data systems, Amazon Web Services (AWS)	10
V	Supervised Learning: Regression, linear models, Regression trees, Time-series Analysis, Forecasting, Classification: classification trees, Logistic regression, separating hyperplanes, k-NN.	10
VI	Unsupervised Learning: Principal Components Analysis (PCA), k-means clustering, Hierarchical clustering, Ensemble methods	10

	Reinforcement Learning: Types of Reinforcement Learning, Various Practical applications of Reinforcement Learning, compare Reinforcement learning with Semi Supervised Learning	
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Books and Reference

Books and Reference:					
Sr.No	Title	Author	Publisher	Edition	Year
1	Doing Data Science	Rachel Schutt and Cathy O'Neil	O'Reilly	-	2013
2	Mastering Machine Learning with R	Cory Lesmeister, PACKT Publication, 2015	PACKT Publication	-	2015
3	Hands-On Programming with R	Garrett Golemund	-	1 st Edition	2014
4	An Introduction to Statistical Learning	James, G. Witten, D. Hastie, T. Tibshirani, R. Springer	-	-	2015

B.Sc (Information Technology)		Semester - V	
Course Name: Data Science Practical		Course Code: UGIT5P3B	
Periods per week (1 Period is 50 minutes)		4	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

PGIT5P3B Data Science

Course Outcomes: After successful completion of this course, students will be able to:

CO1: Solve real-world business challenges with quantitative modeling and data analysis approaches, share findings, and effectively show outcomes with data visualization techniques

CO2: Identify and evaluate moral dilemmas in business pertaining to data security, integrity, privacy, and intellectual property.

CO3: Make well-reasoned ethical business and data management decisions and incorporate ethical principles into routine business operations.

ICT Tools Used: Videos, PPT, Python

Students Centric Methods: Problem Solving and Participative (Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

4. https://onlinecourses.nptel.ac.in/noc21_cs69/preview
5. <https://www.udemy.com/course/python-for-data-science-and-machine-learning-bootcamp/>
6. <https://www.coursera.org/professional-certificates/ibm-data-science>

The CO-PO Mapping Matrix

COP O	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	-	-	2	2	-	-	-	-	-	-	2	-
CO2	-	-	-	2	-	-	-	-	3	-	-	-
CO3	-	-	-	-	-	-	-	2	3	-	-	-

List of Practical's

Sr.No	Practical's
Practical shall be performed using R	
1	Practical of Data collection, Data curation and management for Unstructured data (NoSQL)
2	Practical of Data collection, Data curation and management for Large-scale Data system (such as MongoDB)
3	Practical of Principal Component Analysis
4	Practical of Clustering

5	Practical of Time-series forecasting
6	Practical of Simple/Multiple Linear Regression
7	Practical of Logistics Regression
8	Practical of Hypothesis testing
9	Practical of Analysis of Variance
10	Practical of Decision Tree

B.Sc(Information Technology)			Semester -V		
Course Name: Advance Web Programming			Course Code: UGIT504A		
Periods per week (1 Period is 50 minutes)			4		
Credits			4		
			Hours		Marks
Evaluation System		Theory Examination	2		60
		Internal	--		40

UGIT504A : Advanced Web Programming

Course Outcomes: After successful completion of this course, students will be able to:

CO1: Understand the .NET framework

CO2: Develop a proficiency in the C# programming language.

CO3: Proficiently develop ASP.NET web applications using C#.

CO4: Develop dynamic website using ASP.NET.

CO5: Use ADO.NET for data persistence in a web application

ICT Tools Used: Videos, PPT, Digital board, .Net

Students Centric Methods: Problem Solving and Participative
(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

1. <https://www.udemy.com/course/a-gentle-introduction-to-aspnet-web-forms-for-beginners/>
2. <https://www.coursera.org/learn/intro-to-dotnet-core>

The CO-PO Mapping Matrix

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	-		-	-	-	-	1	1
CO2	-	-	2		-	-	3	2	-	-	-	-
CO3	-	1	-	-	1	-	2	3	-	-	-	1
CO4	-	-	-	-	-	-	2	-	-	-	-	2
CO5	1	-	-	-	-	-	-	2	-	-	-	-

Unit	Details	Lectures
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I	<p>Introducing .NET: The .NET Framework, C#, VB, and the .NET Languages, The Common Language Runtime, The .NET Class Library.</p> <p>The C# Language: C# Language Basics, Variables and Data Types Variable Operations, Object-Based Manipulation, Conditional Logic Loops, Methods.</p>	10
II	<p>Types, Objects, and Namespaces: The Basics About Classes, Building a Basic Class, Value Types and Reference Types, Understanding Namespaces and Assemblies, Advanced Class Programming.</p> <p>Error Handling, Logging, and Tracing: Avoiding Common Error Understanding Exception Handling, Handling Exceptions, Throwing Your Own Exceptions, Using Page Tracing.</p> <p>Web Form Fundamentals: Writing Code, Using the Code-Behind Class, Adding Event Handlers, Understanding the Anatomy of an ASP.NET Application, Introducing Server Controls, Using the Page Class, Using Application Events, Configuring an ASP.NET Application.</p>	10
III	<p>Form Controls: Stepping Up to Web Controls, Web Control Classes, List Controls, Table Controls, Web Control Events and AutoPostBack, Validation, Understanding Validation, Using the Validation Controls, Rich Controls, The Calendar, The AdRotator, Pages with Multiple Views, User Controls and Graphics, User Controls, Dynamic Graphics, The Chart Control.</p> <p>Website Navigation: Site Maps, URL Mapping and Routing, The SiteMapPath Control, The TreeView Control, The Menu Control.</p>	10
IV	<p>State Management: Understanding the Problem of State, Using View State, Transferring Information Between Pages, Using Cookie Managing Session State, Configuring Session State, Using Application State, Comparing State Management Options.</p> <p>Styles, Themes, and Master Pages: Styles, Themes, Master Page Basics, Advanced Master Pages</p> <p>XML: The XML Classes, XMLTextWriter and XMLTextReader</p>	10
V	<p>ADO.NET Fundamentals: Understanding Databases, Configuring Your Database, Understanding SQL Basics, Understanding the Data Provider Model, Using Direct Data Access, Using Disconnected Data Access.</p> <p>Data Binding: Introducing Data Binding, Using Single-Value Data Binding, Using Repeated-Value Data Binding, Working with Data Source Controls</p> <p>The Data Controls: The Grid View, Formatting the GridView, selecting a GridView Row, Editing with the Grid View, Sorting and Paging the Grid View, Using GridView Templates, The DetailsView and Form View</p>	10
VI	<p>Security Fundamentals: Understanding Security Requirements, Authentication and Authorization, Forms Authentication, Windows Authentication.</p> <p>ASP.NET AJAX: Understanding Ajax, Using Partial Refreshes, Using Progress Notification, Implementing Timed Refreshes, Working with the ASP.NET AJAX Control Toolkit.</p>	10

Books and Reference

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Beginning ASP.NET 4.5 in C#	Matthew MacDonald	Apress		2012
2.	C# 2015	Anne Bohem and Joel Murach	Murach	Third	2016
3.	Murach's ASP.NET 4.6 Web Programming in C#2015	MaryDelamater and Anne Bohem	SPD	Sixth	2016
4.	ASP.NET 4.0 programming	J. Kanjilal	Tata McGraw Hill		2011
5.	Programming ASP.NET	D.Esposito	Microsoft Press (Dreamtech)		2011
6.	Beginning Visual C# 2010	K. Watson, C. Nagel, J.H Padderson, J.D. Reid, M.Skinner	Wrox (Wiley)		2010

B.Sc (Information Technology)		Semester -V	
Course Name: Advance Web Programming Practical		Course Code: UGIT5P4A	
Periods per week (1 Period is 50 minutes)		4	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

UGIT5P4A : Advanced Web Programming

Course Outcomes: After successful completion of this course, students will be able to:

CO1: Recognize the .NET architecture

CO2: Gain understanding of the C# programming language.

CO3: Use C# to create ASP.NET web applications with proficiency.

ICT Tools Used: Videos, PPT, Digital board, .Net

Students Centric Methods: Problem Solving and Participative
(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

3. <https://www.udemy.com/course/a-gentle-introduction-to-aspnet-web-forms-for-beginners/>

4. <https://www.coursera.org/learn/intro-to-dotnet-core>

The CO-PO Mapping Matrix

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	-	-	-	-	-	-	1	-
CO2	-	-	2	-	-	-	3	2	-	-	-	-
CO3	-	-	-	-	-	-	2	3	-	-	-	1

List of Practical

1.	Working with basic C# and ASP .NET
a.	Create an application that obtains four int values from the user and displays the product.
b.	Create an application to demonstrate string operations.
c.	Create an application that receives the (Student Id, Student Name, Course Name, Date of Birth) information from a set of students. The application should also display the information of all the students once the data entered.
d.	Create an application to demonstrate following operations i. Generate Fibonacci series. ii. Test for prime numbers. iii. Test for vowels. iv. Use of foreach loop with arrays

	v. Reverse a number and find sum of digits of a number.
2.	Working with Object Oriented C# and ASP .NET
a.	Create simple application to perform following operations i. Finding factorial Value ii. Money Conversion iii. Quadratic Equation iv. Temperature Conversion
b.	Create simple application to demonstrate use of following concepts i. Function Overloading ii. Inheritance (all types) iii. Constructor overloading iv. Interfaces
c.	Create simple application to demonstrate use of following concepts i. Using Delegates and events ii. Exception handling
3.	Working with Web Forms and Controls
a.	Create a simple web page with various sever controls to demonstrate setting and use of their properties. (Example : AutoPostBack)
b.	Demonstrate the use of Calendar control to perform following operations. a) Display messages in a calendar control b) Display vacation in a calendar control c) Selected day in a calendar control using style d) Difference between two calendardates
c.	Demonstrate the use of Treeview control perform following operations. a) Treeview control and datalist b) Treeview operations
4.	Working with Form Controls
a.	Create a Registration form to demonstrate use of various Validation controls.
b.	Create Web Form to demonstrate use of Adrotator Control.
c.	Create Web Form to demonstrate use User Controls.
5.	Working with Navigation, Beautification and Master page.
a.	Create Web Form to demonstrate use of Website Navigation controls and Site Map.
b.	Create a web application to demonstrate use of Master Page with applying Styles and Themes for page beautification.
c.	Create a web application to demonstrate various states of ASP.NET Pages.
6.	Working with Database
a.	Create a web application bind data in a multiline textbox byquerying in another textbox.
b.	Create a web application to displayrecords by using database.
c.	Demonstrate the use of Datalist link control.
7.	Working with Database
a.	Create a web application to display Databinding using dropdownlist control.
b.	Create a web application for to display the phone no of an author using database.
c.	Create a web application for inserting and deleting record from a database. (Using Execute-Non Query).
8.	Working with data controls
a.	Create a web application to demonstrate various uses and properties of SqlDataSource.

b.	Create a web application to demonstrate data binding using DetailsView and FormView Control.
c.	Create a web application to display Using Disconnected Data Access and Databinding using GridView.
9.	Working with GridView control
a.	Create a web application to demonstrate use of GridView control template and GridView hyperlink.
b.	Create a web application to demonstrate use of GridView button column and GridView events.
c.	Create a web application to demonstrate GridView paging and Creating own table format using GridView.
10.	Working with AJAX and XML
a.	Create a web application to demonstrate reading and writing operation with XML.
b.	Create a web application to demonstrate Form Security and Windows Security with proper Authentication and Authorization properties.
c.	Create a web application to demonstrate use of various Ajax controls.
11.	Programs to create and use DLL

B.Sc(Information Technology)		Semester -V	
Course Name: Data Analysis and Visualization		Course Code: UGIT504B	
Periods per week (1 Period is 50 minutes)		4	
Credits		4	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Internal	--	40

UGIT504B Data Analysis and Visualization Practical

Course Outcomes: After successful completion of this course, students will be able to:

CO-1: Describe basic of data visualisation

CO-2: Implement visualisation of distributions

CO-3: Right program on visualisation of time series, proportions and associations

CO-4: Apply visualisation on trends and uncertainty

ICT Tools Used: Videos, PPT, Pen-Tablet, Mobile Apps

Students Centric Methods: Problem Solving and Participative
(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

1) <https://www.udemy.com/course/discrete-math/>

2) <https://www.coursera.org/learn/discrete-mathematics>

3) https://onlinecourses.nptel.ac.in/noc23_cs109/preview

The CO-PO Mapping Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	-	-	-	1
CO2	-	1	-	-	2	-	-	-	-	-	1	-
CO3	-	-	-	2	-	-	-	-	-	2	-	2
CO4	-	1	-	3	-	-	-	-	-	-	1	-

Objectives:

The objective of this course is to teach the Data Handling and Visualization which helps the learner develops the skills to collect, organise, display, analyse and interpret this information. This enables the learner to participate meaningfully in political, social and economic activities. It is very essential to make it easier to identify patterns, trends and outliers in large data sets. The term is often used interchangeably with others, including information graphics, information visualization and statistical graphics and make it sure that it is performing great and as per the specifications.

Expected Learning Outcomes:

After successful completion of this course, student will be able to:

1. Describe basic of data visualisation
2. Implement visualisation of distributions
3. Right program on visualisation of time series, proportions and associations
4. Apply visualisation on trends and uncertainty

Unit	Details	Lectures
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I	Introduction to Visualization Visualising data mapping, data on aesthetics, aesthetics and types of data, scales map data, values on to aesthetics, coordinates system and axes Cartesian coordinates, non-linear axes, coordinate system with curved axes	10
II	Colour scale Colour as a tool to distinguish, colour to represent data values, colour as a tool to highlight Directory of visualization Amount, Distribution, Proportions, XY Relationship, Geo-spatial data.	10
III	Visualising Distributions Visualising amounts, Bar plots group and Stacked bars dot plots and heat maps, histograms and density plots, visualising is single distribution, visualising multiple distribution at same time, Empirical cumulative distribution functions and QQ plots-empirical cumulative distribution functions, highly skewed distributions	10
IV	Quantile Quantile plots,visualizing distribution at once visualising distribution along the vertical axis visualising distribution along the horizontal axis	10
V	Visualising proportions a case for pie charts, a case for side bysidebars, a case for stacked bars and stacked densities, Visualising proportions Separately as part of totals	10
VI	Visualising nested proportions Nested proportion gone wrong, Mosaic plot and tree maps, nested pies parallel set, visualising association among two or more quantitative variables- scatter plots correlograms, dimension reduction paired data	10

Books and Reference:					
Sr.No	Title	Author	Publisher	Edition	Year
1	"Fundamentals of Data Visualization. A Primer on Making Informative and Compelling Figures"	Claus Wilke	O'Reilly	1st edition	2019
2	A Typical Data Science Team, Analysis and Visualization	Tony Fitschetti Brett Lantz	O'Reilly	-	2016
3	Data Analysis and Visualization Using Python: Analyze Data to Create	Ossama Embarak	-	-	-
4	Visualizations for BI Systems	-	Apress	-	2018
Sr.No	Links:				
1	https://www.netquest.com/hubfs/docs/ebook-data-visualization-EN.pdf				
2	https://www.coursera.org/learn/data-visualization				
3	https://clauswilke.com/dataviz/time-series.html				

B.Sc (Information Technology)		Semester -V	
Course Name: Data Analysis and Visualization Practical		Course Code: UGIT5P4B	
Periods per week (1 Period is 50 minutes)		4	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

UGIT5P4B Data Analysis and Visualization Practical

Course Outcomes: After successful completion of this course, students will be able to:

CO-1: Give an overview of data visualization basics.

CO-2: Make distributions visually appealing

CO-3: Appropriate software for visualizing proportions, relationships, and time series

CO-4: Use visualization to examine patterns and ambiguity

ICT Tools Used: Videos, PPT, Pen-Tablet, Mobile Apps

Students Centric Methods: Problem Solving and Participative (Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

4) <https://www.udemy.com/course/discrete-math/>

5) <https://www.coursera.org/learn/discrete-mathematics>

6) https://onlinecourses.nptel.ac.in/noc23_cs109/preview

The CO-PO Mapping Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	-	-	-	2
CO2	-	2	-	-	-	-	-	-	-	-	1	-
CO3	-	-	-	3	-	-	-	-	-	1	-	-
CO4	-	-	-	2	-	-	-	-	-	-	2	-

List of Practical's

Sr.No	Practical's
1	Consist of at least 10 practical experiments covering the topics of the syllabus

Semester – VI

B.Sc(Information Technology)		Semester -VI	
Course Name: Software Quality Assurance		Course Code: UGIT601	
Periods per week (1 Period is 50 minutes)		4	
Credits		4	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Internal	--	40

UGIT601 Software Quality Assurance

Course Outcomes: After successful completion of this course, students will be able to:

CO1: Develop methods and procedures for software development that can scale up for large systems and that can be used to consistently produce high-quality software at low cost and with a small cycle time.

CO-2: learn systematic approach to the development, operation, maintenance, and retirement of software.

CO-3: Learn how to use available resources to develop software, reduce cost of software and how to maintain the quality of software.

CO-4: Methods and tools of testing and maintenance of software.

ICT Tools Used: Videos, PPT, packet tracer

Students Centric Methods: _Problem Solving and Participative (Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

1. <https://www.udemy.com/course/software-quality-assurance/>
2. <https://www.coursera.org/specializations/software-testing-automation>

The CO-PO Mapping Matrix

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	2	-	-	-	2	-	-	-	-	2
CO2	-	-	2	-	-	-	-	-	1	-	-	-
CO3	-	-	-	-	-	2	-	-	-	-	2	-
CO4	3	-	-	2	-	-	2	-	-	-	-	-

Objectives:

The objective of this course is to teach the Software quality assurance helps in finalising the software product or app against business and user necessities. It is very essential to have better test coverage for testing the software app totally and make it sure that it is performing great and as per the specifications.

Expected Learning Outcomes:

- Develop methods and procedures for software development that can scale up for large systems and that can be used to consistently produce high-quality software at low cost and with a small cycle time
- Student learn systematic approach to the development, operation, maintenance, and retirement of software
- Student learn how to use available resources to develop software, reduce cost of software and how to maintain quality of software
- Methods and tools of testing and maintenance of software's.

Unit	Details	Lectures
I	<p>Introduction: Historical Perspective of Quality, What is Quality? (Is it a fact or perception?), Definitions of Quality, Core Components of Quality, Quality View, Financial Aspect of Quality, Customers, Suppliers and Processes, Total Quality Management (TQM), Quality Principles of Total Quality Management, Quality Management Through Statistical Process Control, Quality Management Through Cultural Changes, Continual (Continuous) Improvement Cycle, Quality in Different Areas, Benchmarking and Metrics, Problem Solving Techniques, Problem Solving Software Tools.</p> <p>Software Quality: Introduction, Constraints of Software Product Quality Assessment, Customer is a King, Quality and Productivity Relationship, Requirements of a Product, Organization Culture, Characteristics of Software, Software Development Process, Types of Products, Schemes of Criticality Definitions, Problematic Areas of Software Development Life Cycle, Software Quality Management, Why Software Has Defects? Processes Related to Software Quality, Quality Management System Structure, Pillars of Quality Management System, and Important Aspects of Quality Management.</p>	10
II	<p>Fundamentals of testing: Introduction, Necessity of testing, What is testing? Fundamental test process, The psychology of testing, Historical Perspective of Testing, Definitions of Testing, Approaches to Testing, Testing During Development Life Cycle, Requirement Traceability Matrix, Essentials of Software Testing, Workbench, Important Features of Testing Process, Misconceptions About Testing, Principles of Software Testing, Salient Features of Good Testing, Test</p>	10

	Policy, Test Strategy or Test Approach, Test Planning, Testing Process and Number of Defects Found in Testing, Test Team Efficiency, Mutation Testing, Challenges in Testing, Test Team Approach, Process Problems Faced by Testing, Cost Aspect of Testing, Establishing Testing Policy, Methods, Structured Approach to Testing.	
III	<p>Defect Management: Categories of Defect, Defect, Error, or Mistake in Software, Developing Test Strategy, Developing Testing Methodologies (Test Plan), Testing Process, Attitude Towards Testing (Common People Issues), Test Methodologies/Approaches, People Challenges in Software Testing, Raising Management Awareness for Testing, Skills Required by Tester, Testing throughout the software life cycle, Software development models, Test levels, Test types, the targets of testing, Maintenance testing.</p> <p>Unit Testing: Normal Boundary Value Testing, Robust Boundary Value Testing, Worst-Case Boundary Value Testing, Special Value Testing, Examples, Random Testing, Guidelines for Boundary Value Testing, Equivalence Class Testing: Equivalence Classes, Traditional Equivalence Class Testing, Improved Equivalence Class Testing, Edge Testing, Guidelines and Observations.</p>	10
IV	<p>Table-Based Testing: Table-Based Testing: Decision Tables, Decision Table Techniques, Cause-and-Effect Graphing, Guidelines and Observations, Path Testing: Program Graphs, DD-Paths, Test Coverage Metrics, Basis Path Testing, Guidelines and Observations, Data Flow Testing: Define/Use Testing, Slice-Based Testing, Program Slicing Tools.</p> <p>Software Verification and Validation : Introduction, Verification, Verification Workbench, Methods of Verification, Types of reviews on the basis of Stage Phase, Entities involved in verification, Reviews in testing lifecycle, Coverage in Verification, Concerns of Verification, Validation, Validation Workbench, Levels of Validation, Coverage in Validation, Acceptance Testing, Management of Verification and Validation, Software development verification and validation activities.</p>	10
V	<p>V-Test Model: Introduction, V-model for software, Testing during Proposal stage, Testing during requirement stage, Testing during test planning phase, Testing during design phase, Testing during coding, VV Model, Critical Roles and Responsibilities.</p> <p>Levels of Testing: Introduction, Proposal Testing, Requirement Testing, Design Testing, Code Review, Unit Testing, Module Testing, Integration Testing, Big-Bang Testing, Sandwich Testing, Critical Path First, Sub System Testing, System Testing, Testing Stages.</p>	10
VI	<p>Special Tests: Introduction, GUI testing, Compatibility Testing, Security Testing, Performance Testing, Volume Testing, Stress Testing, Recovery Testing, Installation Testing, Requirement Testing, Regression Testing, Error Handling Testing, Manual Support Testing, Intersystem Testing, Control Testing, Smoke Testing, Adhoc Testing, Parallel Testing, Execution Testing, Operations Testing, Compliance Testing, Usability Testing, Decision Table Testing, Documentation</p>	10

	Testing, Training testing, Rapid Testing, Control flow graph, Generating tests on the basis of Combinatorial Designs, State Graph, Risk Associated with New Technologies, Process maturity level of Technology, Testing Adequacy of Control in New technology usage, Object Oriented Application Testing, Testing of Internal Controls, COTS Testing, Client Server Testing, Web Application Testing, Mobile Application Testing, e-Businesses Commerce Testing, Agile Development Testing, Data Warehousing Testing	
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Books and Reference

Books and Reference:					
Sr.No	Title	Author	Publisher	Edition	Year
1	Software Testing and Continuous Quality Improvement	William E. Lewis	CRC Press	3 rd	2016
2	Software Testing: Principles, Techniques and Tools	M. G. Limaye	TMH		2017
3	Foundations of Software Testing	Dorothy Graham Erik van Veenendaal, Isabel Evans, Rex Black	Cengage Learning	3 rd	
4	Software Testing: A Craftsman's Approach	Paul C. Jorgenson	CRC Press	4 th	2017

B.Sc (Information Technology)		Semester -VI	
Course Name: Software Quality Assurance Practical		Course Code: UGIT6P1	
Periods per week (1 Period is 50 minutes)		4	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

UGIT6P1 Software Quality Assurance

Course Outcomes: After successful completion of this course, students will be able to:

CO1: Create software development processes and methodologies that can be scaled up for large systems and that can be utilized to reliably generate high-quality software at a cheap cost and a short cycle time.

CO-2: Gain knowledge about a methodical approach to software development, use, upkeep, and retirement.

CO-3: Acquire knowledge on how to create software using the resources at hand, how to keep software costs down, and how to maintain software quality.

ICT Tools Used: Videos, PPT, packet tracer

Students Centric Methods: _Problem Solving and Participative (Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

3. <https://www.udemy.com/course/software-quality-assurance/>
4. <https://www.coursera.org/specializations/software-testing-automation>

The CO-PO Mapping Matrix

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	2	-	-	-	2	-	-	-	-	2
CO2	-	-	2	-	-	-	2	-	-	-	-	-
CO3	-	3	-	-	-	-	-	-	-	-	2	-

List of Practical's

Sr.No	Practical's
1	Understand The Automation Testing Approach (Theory Concept)
2	INTRODUCTION TO SELENIUM
3	Using Selenium IDE; Write a test suite containing minimum 4 testcases for different formats
4	Conduct a test suite for any two web sites
5	Install Selenium server and demonstrate it using a script in Java/PHP Installation of Selenium RC and Eclipse
6	Write and test a program to login a specific web page.
7	Write and test a program to update 10 student records into table into Excel file .
8	Write and test a program to select the number of students who have scored more than 60 in any one subject (or all subjects)(using java script)
9	Write and test a program to provide total number of objects present / available on the page

10	Write and test a program to get the number of list items in a list / combo box.
11	Write and test a program to count number of check boxes on the page checked and unchecked count
12	Load Testing using JMeter, Android Application testing using Appium Tools, Bugzilla Bug tracking tools
13	Working with Bugzilla (Bug tracking tool)

B. Sc (Information Technology)		Semester – VI	
Course Name: Project		Course Code: UGIT602	
Periods per week (1 Period is 50 minutes)		4	
Credits		6	
		Hours	Marks
Evaluation System	Project Submission and Viva Voce	2	200
	Internal	--	

Objectives:

To decide the future scope and further enhancement of the system. Plan for several appendices to be placed in support with the project report documentation. Work effectively as an individual or as a team member to produce correct, efficient, well organized and documented programs in a reasonable time.

Expected Learning Outcomes:

- Recognize problems that are amenable to computer solutions, and knowledge of the tool necessary for solving such problems.
 - Develop of the ability to assess the implications of work performed.
 - Get good exposure and command in one or more application areas and on the software
- Develop quality software using the software engineering principles • Develop of the ability to communicate effectively.

Type of the Project

The majority of the students are expected to work on a real-life project preferably in some industry/Research and Development Laboratories/Educational Institution/Software Company. Students are encouraged to work in the areas listed below. However, it is not mandatory for a student to work on a real-life project. The student can formulate a project problem with the help of her/his Guide and submit the project proposal of the same. Approval of the project proposal is mandatory. If approved, the student can commence working on it, and complete it. Use the latest versions of the software packages for the development of the project.

Introduction

The project report should be documented with scientific approach to the solution of the problem that the students have sought to address. The project report should be prepared in order to solve the problem in a methodical and professional manner, making due references to appropriate techniques, technologies and professional standards. The student should start the documentation process from the first phase of software development so that one can easily identify the issues to be focused upon in the ultimate project report. The student should also include the details from the project diary, in which they will record the progress of their project throughout the course. The project report should contain enough details to enable examiners to evaluate the work. The important points should be highlighted in the body of the report, with details often referred to appendices.

PROJECT REPORT:

Title Page

Original Copy of the Approved Proforma of the Project Proposal

Certificate of Authenticated work

Role and Responsibility Form

Abstract

Acknowledgement

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CHAPTER 1: INTRODUCTION

1.1 Background

1.2 Objectives

1.3 Purpose, Scope, and Applicability

1.3.1 Purpose

1.3.2 Scope

1.3.3 Applicability

1.4 Achievements

1.5 Organisation of Report

CHAPTER 2: SURVEY OF TECHNOLOGIES

CHAPTER 3: REQUIREMENTS AND ANALYSIS

3.1 Problem Definition

3.2 Requirements Specification

3.3 Planning and Scheduling

3.4 Software and Hardware Requirements

3.5 Preliminary Product Description

3.6 Conceptual Models

CHAPTER 4: SYSTEM DESIGN

4.1 Basic Modules

4.2 Data Design

4.2.1 Schema Design

4.2.2 Data Integrity and Constraints

4.3 Procedural Design

4.3.1 Logic Diagrams

4.3.2 Data Structures

4.3.3 Algorithms Design

4.4 User interface design

4.5 Security Issues

4.6 Test Cases Design

The documentation should use tools like star UML, Visuo for windows, Rational Rose for design

as part of Software Project Management Practical Course. The documentation should be spiral

bound for semester V and the entire documentation should be hard bound during semester VI.

CHAPTER 5: IMPLEMENTATION AND TESTING

5.1 Implementation Approaches

5.2 Coding Details and Code Efficiency

5.2.1 Code Efficiency

5.3 Testing Approach

5.3.1 Unit Testing

5.3.2 Integrated Testing

5.3.3 Beta Testing

5.4 Modifications and Improvements

5.5 Test Cases

CHAPTER 6: RESULTS AND DISCUSSION

6.1 Test Reports

6.2 User Documentation

CHAPTER 7: CONCLUSIONS

7.1 Conclusion

7.1.1 Significance of the System

7.2 Limitations of the System

7.3 Future Scope of the Project

REFERENCES

Objectives:

The main objective of this course is to make students familiar with the developments that are being taking place in the different areas with the help of Computer Science and Information Technology. To acquaint the students with the national and international legal order relative to these

Expected Learning Outcomes:

- Student will be able to understand plan and prepare for all stages of an investigation
- Student will be able to initial response.
- Student will be able to and management interaction.
- Student will be able to investigate various media to collect evidence.
- Student will be able to report them in a way that would be acceptable in the court of law
- Student will be able to use existing statutes to determine who is liable for online: defamation; copyright infringement; and failure to protect data.

Unit	Details	Lectures
I	<p>Power of Arrest Without Warrant Under the IT Act, 2000: A Critique, Crimes of this Millennium, Section 80 of the IT Act, 2000 – A Weapon or a Farce? Forgetting the Line Between Cognizable and Non-Cognizable Offences, Necessity of Arrest without Warrant from Any Place, Public or Otherwise, Check and Balances Against Arbitrary Arrests, Arrest for “About to Commit” an Offence Under the IT Act: A Tribute to Draco, Arrest, But NO Punishment!</p> <p>Cyber Crime and Criminal Justice: Penalties, Adjudication and Appeals Under the IT Act, 2000: Concept of “Cyber Crime “ and the IT Act , 2000, Hacking, Teenage Web Vandals, Cyber Fraud and Cyber Cheating, Virus on the Internet, Defamation, Harassment and E-mail Abuse, Cyber Pornography, Other IT Act Offences, Monetary Penalties, Adjudication and Appeals Under IT Act , 2000, Network Service Providers, Jurisdiction and Cyber Crime, Nature of Cyber Criminality, Strategies to Tackle Cyber Crime and Trends, Criminal Justice in India and Implications on Cyber Crime.</p>	10
II	<p>Contracts in the Infotech World: Contracts in the Infotech World, Click-Wrap and Shrink-Wrap Contract: Status under the Indian Contract Act, 1872, Contract Formation Under the Indian Contract Act, 1872, Contract Formation on the Internet, Terms and Conditions of Contracts.</p> <p>Jurisdiction in the Cyber World: Questioning the Jurisdiction and Validity of the Present Law of Jurisdiction, Civil Law of Jurisdiction in India, Cause of Action, Jurisdiction and the Information Technology</p>	10

	Act,2000, Foreign Judgements in India, Place of Cause of Action in Contractual and IPR Disputes, Exclusion Clauses in Contracts, Abuse of Exclusion Clauses, Objection of Lack of Jurisdiction, Misuse of the Law of Jurisdiction, Legal Principles on Jurisdiction in the United State of America, Jurisdiction Disputes w.r.t. the Internet in the United State of America.	
III	Battling Cyber Squatters and Copyright Protection in the Cyber World: Concept of Domain Name and Reply to Cyber Squatters, Meta-Tagging, Legislative and Other Innovative Moves Against Cyber Squatting, The Battle Between Freedom and Control on the Internet, Works in Which Copyright Subsists and meaning of Copyright, Copyright Ownership and Assignment, License of Copyright, Copyright Terms and Respect for Foreign Works, Copyright Infringement, Remedies and Offences, Copyright Protection of Content on the Internet; Copyright Notice, Disclaimer and Acknowledgement, Downloading for Viewing Content on the Internet, Hyper-Linking and Framing, Liability of ISPs for Copyright Violation in the Cyber World: Legal Developments in the US, Napster and its Cousins: A Revolution on the Internet but a Crisis for Copyright Owners, Computer Software Piracy.	10
IV	E-Commerce Taxation: Real Problems in the Virtual World: A Tug of War on the Concept of „Permanent Establishment“, Finding the PE in Cross Border E-Commerce, The United Nations Model Tax Treaty, The Law of Double Taxation Avoidance Agreements and Taxable Jurisdiction Over Non-Residents, Under the Income Tax Act, 1961, Tax Agents of Non-Residents under the Income Tax Act,1961 and the Relevance to E-Commerce, Source versus Residence and Classification between Business Income and Royalty, The Impact of the Internet on Customer Duties, Taxation Policies in India: At a Glance. Digital Signature, Certifying Authorities and E-Governance: Digital Signatures, Digital Signature Certificate, Certifying Authorities and Liability in the Event of Digital Signature Compromise, E-Governance in India: A Warning to Babudom!	10
V	The Indian Evidence Act of 1872 v. Information Technology Act, 2000: Status of Electronic Records as Evidence, Proof and Management of Electronic Records; Relevancy, Admissibility and Probative Value of E-Evidence, Proving Digital Signatures, Proof of Electronic Agreements, Proving Electronic Messages, Other Amendments in the Indian Evidence Act by the IT Act, Amendments to the Bankers Books Evidence Act, 1891 and Reserve Bank of India Act, 1934.	10
VI	Protection of Cyber Consumers in India: Are Cyber Consumers Covered Under the Consumer Protection Act? Goods and Services, Consumer Complaint, Defect in Goods and Deficiency in Services, Restrictive and Unfair Trade Practices, Instances of Unfair Trade Practices, Reliefs Under CPA, Beware Consumers, Consumer Foras, Jurisdiction and Implications on cyber Consumers in India, Applicability of CPA to Manufacturers, Distributors, Retailers and Service Providers Based in Foreign Lands Whose Goods are Sold or Services Provided to a Consumer in India. Amendments in Indian IT Act 2000	10

Books and References:

Sr.No.	Title	Author/s	Publisher	Edition
1.	Cyber Law Simplified	Vivek Sood	TMH Education	
2.	Cybersecurity Law	Jeff Kosseff	Wiley	

B.Sc (Information Technology)		Semester -VI	
Course Name: Cyber Laws Practical		Course Code: UGIT6P3A	
Periods per week (1 Period is 50 minutes)		4	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

UGIT6P3A Cyber Laws

Course Outcomes: After successful completion of this course, students will be able to:

CO1: Recognize, organize, and get ready for every phase of an inquiry.

CO2: Recognize the different guidelines and protocols for the application of the cyber laws

CO3: Recognize how management interacts

ICT Tools Used: Videos, PPT, Android studio

Students Centric Methods: _Problem Solving and Participative
(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

3. <https://www.udemy.com/course/master-in-cyber-security-law-and-policy/>

4. https://onlinecourses.swayam2.ac.in/cec22_1w07/preview

The CO-PO Mapping Matrix

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	3	-	-	-	-	-	-	-	-	-
CO2	1	-	-	-	-	-	-	-	-	-	-	2
CO3	1	-	-	-	-	-	-	-	-	2	-	-

List of Practical's

Sr.No	Practical's
1	Case Study on Tampering with Computer source documents- Section 65
2	Case Study on Hacking with Computer systems, Data alteration- Section 66 Sending offensive messages through communication service, etc.- Section 66A Retains any stolen computer resource or communication device - Section 66B Fraudulent use of electronic signature-Section 66C

3	Case study on Cheats by personating- Section 66D Publishing obscene images- Section 66E Cyber terrorism- Section 66F
4	Case study on Publishes or transmits unwanted material –Section 67 Publishes or transmits sexually explicit material -Section 67A Abusing children online- Section 67B
5	Case study on Breach of Confidentiality and Privacy –Section 72 Disclosure of information in breach of contract – Section 72A
6	Case study on Publishing false digital signature certificates-Section 73 & Section 74
7	Case study on copyright infringement, remedies and offences-section 51 and section 52.
8	Case study on Electronic records as evidence.
9	Case study on Intellectual Property Rights in Cyber Space
10	Case study on protection of cyber consumers of India.

B. Sc (Information Technology)		Semester – VI	
Course Name: Business Intelligence		Course Code: UGIT603B	
Periods per week (1 Period is 50 minutes)		4	
Credits		4	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Internal	--	40

UGIT603B Business Intelligence

Course Outcomes: After successful completion of this course, students will be able to: **CO1:** Develop methods and procedures for Analysis that can help for large systems and that can be used to Making a decision within a time

CO2: improve decision making capabilities when they assess the BI Architecture.

CO3: build and enhance business intelligence capabilities by adapting the appropriate technology and software solutions.

CO4: understand methods and tools of BI.

ICT Tools Used: Videos, PPT, Power BI, MS Excel, R studio

Students Centric Methods: Problem Solving and Participative (Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

1. <https://www.udemy.com/course/business-data-analysis-using-microsoft-power-bi/>
2. <https://www.coursera.org/learn/foundations-of-business-intelligence>
3. https://onlinecourses.nptel.ac.in/noc20_mg11/preview

The CO-PO Mapping Matrix

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	2	-	-	3	-	-	-	-	2
CO2	-	-	2	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	2	-
CO4	1	-	-	-	-	3	-	-	-	-	-	-

Objectives:

The objective of this course is to teach the key concept and issue related to business intelligence and decision support system. It focusses on data warehouses, design methods and ETL Processes and OLAP system. It is very essential to make better decision on the basis of analysis and make it sure that it is performing great and as per the specifications.

Expected Learning Outcomes:

- Develop methods and procedures for Analysis that can help for large systems and that can be used to Making a decision within a time
- Student will able to improve decision making capabilities when they assess the BI Architecture.
- Student will able to improve decision making capabilities when they assess the BI Architecture.
- Student will able to build and enhance business intelligence capabilities by adapting the appropriate technology and software solutions.
- Student will able to understand methods and tools of BI.

Unit	Details	Lectures
I	<p>Business intelligence: Effective and timely decisions, Data, information and knowledge, The role of mathematical models, Business intelligence architectures, Ethics and business intelligence</p> <p>Decision support systems: Definition of system, Representation of the decision-making process, Evolution of information systems, Definition of decision support system, Development of a decision support system.</p>	10

II	<p>Data Warehouse: Definition of data warehouse, DataMart's, Data quality, Data warehouse architecture, ETL tools, Metadata, Cubes and multidimensional analysis</p> <p>Mathematical models for decision making: Structure of mathematical models, Development of a model, Classes of models</p>	10
III	<p>Data mining: Definition of data mining, Representation of input data, Data mining process, Analysis methodologies</p> <p>Data preparation: Data validation, Data transformation, Data reduction</p>	10
IV	<p>Classification: Classification problems, Evaluation of classification models, Bayesian methods, Logistic regression, Neural networks, Support vector machines</p> <p>Clustering: Clustering methods, Partition methods, Hierarchical methods, Evaluation of clustering models</p>	10
V	<p>Business intelligence applications:</p> <p>Marketing models: Relational marketing, Sales force management,</p> <p>Logistic and production models: Supply chain optimization, Optimization models for logistics planning, Revenue management systems.</p> <p>Data envelopment analysis: Efficiency measures, Efficient frontier, The CCR model, Identification of good operating practices</p>	10
VI	<p>Knowledge Management: Introduction to Knowledge Management, Organizational Learning and Transformation, Knowledge Management Activities, Approaches to Knowledge Management, Information Technology (IT) In Knowledge Management, Knowledge Management Systems Implementation, Roles of People in Knowledge Management</p> <p>Artificial Intelligence and Expert Systems: Concepts and Definitions of Artificial Intelligence, Artificial Intelligence Versus Natural Intelligence, Basic Concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, Development of Expert Systems</p>	10

Books and References:

Title	Author	Publisher	Edition	Year
Business Intelligence: Data Mining and Optimization for Decision Making	Carlo Vercellis	Wiley	First	2009
Decision support and Business Intelligence Systems	Efraim Turban, Ramesh Sharda, Dursun Delen	Pearson	Ninth	2011
Fundamental of Business Intelligence	Grossmann W, Rinderle-Ma	Springer	First	2015

B. Sc (Information Technology)		Semester – VI	
Course Name: Business Intelligence Practical		Course Code: UGIT6P3B	
Periods per week (1 Period is 50 minutes)		4	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

UGIT6P3B Business Intelligence

Course Outcomes: After successful completion of this course, students will be able to:
CO1: Provide techniques and protocols for analysis that can support huge systems and be applied to quickly arrive at a decision.
CO2: enhance their ability to make decisions when evaluating the BI Architecture.
CO3: By using the right hardware and software, develop and improve business intelligence capabilities.

ICT Tools Used: Videos, PPT, Power BI, MS Excel, R studio

Students Centric Methods: Problem Solving and Participative (Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

4. <https://www.udemy.com/course/business-data-analysis-using-microsoft-power-bi/>
5. <https://www.coursera.org/learn/foundations-of-business-intelligence>
6. https://onlinecourses.nptel.ac.in/noc20_mg11/preview

The CO-PO Mapping Matrix

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	1	-	-	3	-	-	-	-	2
CO2	-	-	3	-	-	-	-	-	-	-	-	-
CO3	-	-	2	-	-	-	-	-	-	-	2	-

List of Practicals:

Practical No	Details
1	Import the legacy data from different sources such as (Excel, SqlServer, Oracle etc.) and load in the target system. (You can download sample database such as Adventureworks, Northwind, foodmart etc.)
2	Perform the Extraction Transformation and Loading (ETL) process to construct the database in the Sqlserver.
3	a. Create the Data staging area for the selected database. b. Create the cube with suitable dimension and fact tables based on ROLAP, MOLAP and HOLAP model.
4	a. Create the ETL map and setup the schedule for execution. b. Execute the MDX queries to extract the data from the data warehouse

5	a. Import the data warehouse data in Microsoft Excel and create the Pivot table and Pivot Chart. b. Import the cube in Microsoft Excel and create the Pivot table and Pivot Chart to perform data analysis.
6	Apply the what – if Analysis for data visualization. Design and generate necessary reports based on the data warehouse data.
7	Perform the data classification using classification algorithm.
8	Perform the data clustering using clustering algorithm.
9	Perform the Linear regression on the given data warehouse data.
10	Perform the logistic regression on the given data warehouse data.

Course Name: Security in Computing			Course Code: UGIT604A	
Periods per week (1 Period is 50 minutes)			4	
Credits			4	
			Hours	Marks
Evaluation System		Theory Examination	2	60
		Internal	--	40

UGIT604A Security in Computing

Course Outcomes: After successful completion of this course, students will be able to:

CO1: understand the Security in computing concept.

CO2: implement the AAA Authentication..

CO3: Configure, Apply and Verify an Extended Numbered ACL

CO4: Configure IP ACLs to Mitigate Attacks and IPV6 ACLs

CO5: Configure, Apply and Verify an Extended Numbered ACL

ICT Tools Used: Videos, PPT, packet tracer

Students Centric Methods: Problem Solving and Participative
(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

1. <https://www.coursera.org/learn/introduction-to-computer-security>
2. <https://www.udemy.com/tutorial/the-absolute-beginners-guide-to-information-cyber-security/the-trinity-of-it-security-cia/>
3. https://onlinecourses.nptel.ac.in/noc23_cs127/preview

The CO-PO Mapping Matrix

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	-	3	-	-	-	-	-	-
CO2	-	-	2	-	-	-	3	-	-	-	2	1
CO3	-	-	-	-	-	-	-	-	2	-	-	-
CO4	1	-	-	-	-	-	1	-	-	-	-	2
CO5	-	-	2	-	-	-	1	-	-	-	-	-

Objectives:

The purpose of this course is to provide understanding of the main issues related to security in modern networked computer systems. This covers underlying concepts and foundations of computer security, basic knowledge about security-relevant decisions in designing IT infrastructures, techniques to secure complex systems and practical skills in managing a range of systems, from personal laptop to large-scale infrastructures.

Expected Learning Outcomes:

- Student will be able to understand the Security in computing concept.
- Student will be able to implement the AAA Authentication.
- Student will be able to Configure, Apply and Verify an Extended Numbered ACL.
- Student will be able to Configure IP ACLs to Mitigate Attacks and IPV6 ACLs.
- Student will be able to understand and implement a Zone-Based Policy Firewall
- Student will be able to implement Layer 2 Security.
- Student will be able to understand, design, and implement ASA Basic Settings and

Firewall Using CLI.		
Unit	Details	Lectures
I	<p>1. Information Security Overview: The Importance of Information Protection, The Evolution of Information Security, Justifying Security Investment, Security Methodology, How to Build a Security Program, The Impossible Job, The Weakest Link, Strategy and Tactics, Business Processes vs. Technical Controls.</p> <p>2. Risk Analysis: Threat Definition, Types of Attacks, Risk Analysis.</p> <p>3. Secure Design Principles: The CIA Triad and Other Models, Defense Models, Zones of Trust, Best Practices for Network Defense.</p>	10
II	<p>4. Authentication and Authorization: Authentication, Authorization</p> <p>5. Encryption: A Brief History of Encryption, Symmetric-Key Cryptography, Public Key Cryptography, Public Key Infrastructure.</p> <p>6. Storage Security: Storage Security Evolution, Modern Storage Security, Risk Remediation, Best Practices.</p>	10
III	<p>7. Database Security: General Database Security Concepts, Understanding Database Security Layers, Understanding Database Level Security, Using Application Security, Database Backup and Recovery, Keeping Your Servers Up to Date, Database Auditing and Monitoring.</p> <p>8. Secure Network Design: Introduction to Secure Network Design, Performance, Availability, and Security.</p> <p>9. Network Device Security: Switch and Router Basics, Network Hardening.</p>	10
IV	<p>10. Firewalls: Overview, The Evolution of Firewalls, Core Firewall Functions, Additional Firewall Capabilities, Firewall Design.</p> <p>11. Wireless Network Security: Radio Frequency Security Basics, Data Link Layer Wireless Security Features, Flaws, and Threats, Wireless Vulnerabilities and Mitigations, Wireless Network Hardening Practices and Recommendations, Wireless Intrusion Detection and Prevention, Wireless Network Positioning and Secure Gateways.</p>	10
V	<p>12. Intrusion Detection and Prevention Systems: IDS Concepts, IDS Types and Detection Models, IDS Features, IDS Deployment Considerations, Security Information and Event Management (SIEM).</p> <p>13. Voice over IP (VoIP) and PBX Security: Background, VoIP Components, VoIP Vulnerabilities and Countermeasures, PBX, TEM: Telecom Expense Management.</p> <p>14. Operating System Security Models: Operating System Models, Classic Security Models, Reference Monitor, Trustworthy Computing, International Standards for Operating System Security</p>	10
VI	<p>15. Virtual Machines and Cloud Computing: Virtual Machines, Cloud Computing.</p> <p>16. Secure Application Design: Secure Development Lifecycle, Application Security Practices, Web Application Security, Client Application Security, And Remote Administration Security.</p> <p>17. Physical Security: Classification of Assets, Physical Vulnerability Assessment, Choosing Site Location for Security, Securing Assets: Locks and Entry Controls, Physical Intrusion Detection</p>	10

Books and Reference

Books and Reference:

Sr.No	Title	Author	Publisher	Edition	Year
1	TheCompleteReference: Information Security	Mark Rhodes-Ousle y	MC Graw-Hill	2 nd	2013
2	Essential Cybersecurity Science	Josiah Dykstra	O'Reilly	5 th	2017
3	Principles of Computer Security: CompTIA Security+ and Beyond	Wm.Arthur Conklin, Greg White	MC Graw-Hill	2 nd	2010

B.Sc (Information Technology)			Semester –VI	
Course Name: Security in Computing Practical			Course Code: UGIT6P4A	
Periods per week (1 Period is 50 minutes)			4	
Credits			2	
			Hours	Marks
Evaluation System	Practical Examination		2½	50
	Internal		--	--

UGIT6P4A Security in Computing

Course Outcomes: After successful completion of this course, students will be able to:

CO1: comprehend the idea of security in computing.

CO2: Put AAA authentication into practice.

CO3: Set Up, Utilize, and Check an Extended Numbered ACL

ICT Tools Used: Videos, PPT, packet tracer

Students Centric Methods: _Problem Solving and Participative
(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

4. <https://www.coursera.org/learn/introduction-to-computer-security>
5. <https://www.udemy.com/tutorial/the-absolute-beginners-guide-to-information-cyber-security/the-trinity-of-it-security-cia/>
6. https://onlinecourses.nptel.ac.in/noc23_cs127/preview

The CO-PO Mapping Matrix

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	2	-	-	-	3	-	-	-	2	-
CO3	-	-	1	-	-	-	2	-	-	-	-	-

List of Practical's	
Sr.No	Practical's
1	Configure Routers A. OSPF MD5 authentication B. NTP C. To log messages to the syslog server D. To support SSH connections

2	Configure AAA Authentication A. Configure a local user account on Router and configure authenticate on the console and vty lines using local AAA B. Verify local AAA authentication from the Router console and the PC-A client
3	Configuring Extended ACLs A. Configure, Apply and Verify an Extended Numbered ACL
4	Configure IPACLs to Mitigate Attacks and IPV6 ACLs A. Verify connectivity among devices before firewall configuration. B. Use ACLs to ensure remote access to the routers is available only from management station PC-C. C. Configure ACLs on to mitigate attacks. D Configuring IPv6 ACLs
5	Configuring a Zone-Based Policy Firewall
6	Configure IOS Intrusion Prevention System (IPS) Using the CLI A. Enable IOS IPS. B. Modify an IPS signature
7	Layer 2 Security A. Assign the Central switch as the root bridge. B. Secure spanning-tree parameters to prevent STP manipulation attacks. C. Enable port security to prevent CAM table overflow attacks.
8	Layer 2 VLAN Security
9	Configure and Verify a Site-to-Site IPsec VPN Using CLI
10	Configure ASA Basic Settings and Firewall Using CLI A. Configure basic ASA settings and interface security levels using CLI B. Configure routing, address translation, and inspection policy using CLI

C.	Configure DHCP, AAA, and SSH d Configure a DMZ, Static NAT, and ACLs
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B. Sc (Information Technology)		Semester – VI	
Course Name: Principles of Geographic Information System		Course Code: UGIT604B	
Periods per week (1 Period is 50 minutes)		4	
Credits		4	
		Hours	Marks
Evaluation System	Theory Examination	2	60
	Internal	--	40

UGIT604B Principles of Geographic Information System												
Course Outcomes: After successful completion of this course, students will be able to:												
CO1: describe what geography and GIS												
CO2: understand the importance of scale, projection, and coordinate systems in GIS												
CO3: understand vector and raster data structures and the appropriate use of each of these data structures.												
CO4: understand the basics of data capture, storage, analysis, and output in a GIS												
CO5: understand vector and raster data structures and the appropriate use of each of these data structures.												
ICT Tools Used: Videos, PPT, QGIS												
Students Centric Methods: _Problem Solving and Participative (Experimental, Participative, Problem Solving)												
Links: SWAYAM / MOOCS:												
1. https://www.coursera.org/learn/gis-data-acquisition-map-design												
2. https://www.udemy.com/course/geographic-information-system-in-qgis-basic-of-gis-analysis/												
The CO-PO Mapping Matrix												
CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	-	1	-	2	-	-	-	-
CO2	-	-	-	-	-	2	-	-	-	-	2	2
CO3	2	1	-	-	2	-	-	1	-	-	-	-
CO4	-	-	2	-	-	-	-	-	-	-	-	1
CO5	2	-	-	-	-	1	-	-	-	-	-	-

Unit	Details	Lectures
I	<p>A Gentle Introduction to GIS The nature of GIS: Some fundamental observations, Defining GIS, GISystems, GIScience and GI Applications, Spatial data and Geo information.</p> <p>The real world and representations of it: Models and modeling, Maps, Databases, Spatial databases and spatial analysis</p> <p>Geographic Information and Spatial Database Models and Representations of the real world Geographic Phenomena: Defining geographic phenomena, types of geographic phenomena, Geographic fields, Geographic objects, Boundaries Computer Representations of Geographic Information: Regular tessellations, irregular tessellations, Vector representations, Topology and Spatial relationships, Scale and Resolution, Representation of Geographic fields, Representation of Geographic objects Organizing and Managing Spatial Data The Temporal Dimension</p>	10
II	<p>Data Management and Processing Systems Hardware and Software Trends Geographic Information Systems: GIS Software, GIS Architecture and functionality, Spatial Data Infrastructure (SDI) Stages of Spatial Data handling: Spatial data handling and preparation, Spatial Data Storage and maintenance, Spatial Query and Analysis, Spatial Data Presentation. Database management Systems: Reasons for using a DBMS, Alternatives for data management, The relational data model, Querying the relational database. GIS and Spatial Databases: Linking GIS and DBMS, Spatial database functionality.</p>	10
III	<p>Spatial Referencing and Positioning Spatial Referencing: Reference surfaces for mapping, Coordinate Systems, Map Projections, Coordinate Transformations Satellite-based Positioning: Absolute positioning, Errors in absolute positioning, Relative positioning, Network positioning, code versus phase measurements, Positioning technology</p>	10

IV	<p>Data Entry and Preparation Spatial Data Input: Direct spatial data capture, Indirect spatial data capture, Obtaining spatial data elsewhere Data Quality: Accuracy and Positioning, Positional accuracy, Attribute accuracy, Temporal accuracy, Lineage, Completeness, Logical consistency Data Preparation: Data checks and repairs, Combining data from multiple sources Point Data Transformation: Interpolating discrete data, Interpolating continuous data</p>	10
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<p>V</p>	<p>Spatial Data Analysis Classification of analytical GIS Capabilities Retrieval, classification and measurement: Measurement, Spatial selection queries, Classification Overlay functions: Vector overlay operators, Raster overlay operators Neighborhood functions: Proximity computations, Computation of diffusion, Flow computation, Raster based surface analysis Analysis: Network analysis, interpolation, terrain modeling GIS and Application models: GPS, Open GIS Standards, GIS Applications and Advances Error Propagation in spatial data processing: How Errors propagate, Quantifying error propagation.</p>	<p>10</p>
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VI	Data Visualization GIS and Maps, The Visualization Process Visualization Strategies: Present or explore? The cartographic toolbox: What kind of data do I have? How can I map my data? How to map?: How to map qualitative data, How to map quantitative data, How to map the terrain elevation, How to map time series Map Cosmetics, Map Dissemination	10
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Books and References:

Title	Author/s	Edition	Publisher	Year
Principles of Geographic Information Systems- An Introductory Text Book	Editors: Otto Huisman and Rolf A.	The International Institute of Geoinformation Science and Earth Observation	Fourth	2009
Principles of Geographic Information Systems	P.A Burrough and R.A. McDonnell	Oxford University Press	Third	1999
Fundamentals of Spatial Information Systems,	R.Laurini and D. Thompson,	Academic Press		1994
Fundamentals of Geographic Information Systems	Michael N. Demers	Wiley Publications	Fourth	2009
Introduction to Geographic Information Systems	Chang Kang-tsung (Karl)	McGrawHill	Any above 3rd Edition	2013 7th Edition
GIS Fundamentals: A First Text on Geographic Information Systems	Paul Bolsatd	XanEdu Publishing Inc	5th Edition	

B. Sc (Information Technology)		Semester – VI	
Course Name: Principles of Geographic Information System Practical		Course Code: UGIT6P4B	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	--

UGIT6P4B Principles of Geographic Information System

Course Outcomes: After successful completion of this course, students will be able to:

CO1: Explain geography and GIS.

CO2: Recognize the significance of coordinate systems, projection, and scale in GIS

CO3: Recognize the differences between vector and raster data structures and when to use each one.

CO4: be familiar with the fundamentals of data collection, storing, processing, and output in a geographic information system

ICT Tools Used: Videos, PPT, QGIS

Students Centric Methods: Problem Solving and Participative
(Experimental, Participative, Problem Solving)

Links: SWAYAM / MOOCS:

3. <https://www.coursera.org/learn/gis-data-acquisition-map-design>

4. <https://www.udemy.com/course/geographic-information-system-in-qgis-basic-of-gis-analysis/>

The CO-PO Mapping Matrix

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	1	-	2	-	-	-	-
CO2	2	-	-	-	-	2	-	-	-	-	2	-
CO3	2	-	-	-	-	2	-	-	-	-	-	-
CO4	1	-	2	-	-	1	-	-	-	-	-	1

List of Practicals:

Practical No	Details
1	Familiarizing Quantum GIS: Installation of QGIS, datasets for both Vector and Raster data, Maps.
2	Creating and Managing Vector Data: Adding vector layers, setting properties, formatting, calculating line lengths and statistics
3	Exploring and Managing Raster data: Adding raster layers, raster styling and analysis, raster mosaicking and clipping.
4	Making a Map, Working with Attributes, Importing Spreadsheets or CSV files Using Plugins, Searching and Downloading OpenStreetMap Data
5	Working with attributes, terrain Data
6	Working with Projections and WMS Data
7	Geo referencing Topo Sheets and Scanned Maps Geo referencing Aerial Imagery Digitizing Map Data
8	Managing Data Tables and Spatial data Sets: Table joins, spatial joins, points in polygon analysis, performing spatial queries

9	Advanced GIS Operations 1: Nearest Neighbor Analysis, Sampling Raster Data using Points or Polygons, Interpolating Point Data
10	Advance GIS Operations 2: Batch Processing using Processing Framework Automating Complex Workflows using Processing Modeler
	Automating Map Creation with Print Composer Atlas
11	Validating Map data