

# **SYLLABUS FOR B.VOC IN GEOINFORMATICS (GIM)**

**Programme Template:  
B. Voc. Course (CBCS) in GIM  
Gauhati University**

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<b>Semester</b>	<b>CORE COURSE (12 papers, 72 credits)</b>	<b>Ability Enhancement Compulsory Course (AECC) (2 papers, 8 credits)</b>	<b>Skill Enhancement Course (SEC) (4 papers, 16 credits)</b>	<b>Discipline Specific Elective (DSE) (6 papers, 36 credits)</b>
<b>I</b>	<b>GIM-VC-1016</b>	<b>Eng-AE-1014</b>		
	<b>GIM-VC-1026</b>			
	<b>GIM-VC-1036</b>			
<b>II</b>	<b>GIM-VC-2016</b>	<b>Env-AE-2014</b>		
	<b>GIM-VC-2026</b>			
	<b>GIM-VC-2036</b>			
<b>III</b>	<b>GIM-VC-3016</b>		<b>GIM-SE-3XX4</b>	
	<b>GIM-VC-3026</b>			
	<b>GIM-VC-3036</b>			
<b>IV</b>	<b>GIM-VC-4016</b>		<b>GIM-SE-4XX4</b>	
	<b>GIM-VC-4026</b>			
	<b>GIM-VC-4036</b>			
<b>V</b>			<b>GIM-SE-5XX4</b>	<b>GIM-VC-5016</b>
				<b>GIM-VC-5026</b>
				<b>GIM-VC-5036</b>
<b>VI</b>			<b>GIM-SE-6XX4</b>	<b>GIM-VC-6016</b>
				<b>GIM-VC-6026</b>
				<b>GIM-VC-6036</b>

**Course Structure for CBCS in B. Voc. in Geoinformatics  
as per requirement of UGC & Gauhati University**

Semester	Course Type	Paper Code	Paper Name	Paper Type	Credit
I	Core Course	GIM-VC-1016	Fundamentals of Cartography	Theory + Practical	4+2
		GIM - VC-1026	Fundamentals of Computers	Theory + Practical	4+2
		GIM-VC-1036	Fundamentals of Geographic Information System (GIS)	Theory + Practical	4+2
	Ability Enhancement Compulsory Course	ENG-AE-1014	English Communications	Theory	4
II	Core Course	GIM - VC-2016	Fundamentals of Remote Sensing (RS)	Theory + Practical	4+2
		GIM - VC-2026	Fundamentals of Global Navigation Satellite System (GNSS)	Theory + Practical	4+2
		GIM-VC-2036	Application & Scope of Geoinformatics	Theory + Practical	4+2
	Ability Enhancement Compulsory Course	ENV-AE-2014	Environmental Science	Theory	4
III	Core Course	GIM - VC-3016	Field Survey Techniques in Geoinformatics	Theory + Practical	4+2
		GIM - VC-3026	Digital Image Processing	Theory + Practical	4+2
		GIM - VC-3036	On-Job Training	Theory + Practical	4+2 4
	Skill Enhancement Course	GIM-SE-3014 (ANY ONE)	Fundamentals of Ecology & Wildlife Management	Theory + Practical	2+2
			Fundamentals of Human Settlement & Urban Planning		

			Fundamentals of Disaster Management		
IV	Core Course	GIM - VC-4016	Advanced GIS & Remote Sensing Techniques	Theory + Practical	4+2
		GIM-VC-4026	Advanced Photogrammetry Techniques	Theory + Practical	4+2
		GIM - VC-4036	On-Job Training	Theory + Practical	4+2
	Skill Enhancement Course	GIM-SE-4014 (ANY ONE)	Fundamentals of Land & Wetland Management	Theory + Practical	2+2
			Fundamentals of Water Resource Management		
			Fundamentals of Agriculture & Soil Management		
V	Skill Enhancement Course	GIM-SE-5014	Spoken English & Personal Development	Theory + Practical	2+2
	Discipline Specific Elective	GIM-VE-5016	Research Methodology	Theory + Practical	4+2
		GIM-VE-5026	Project Work – 1	Theory + Practical	4+2
		GIM-VE-5036	Internship - 1	Practical	6
VI	Skill Enhancement Course	GIM-SE-6014	Writing Skills & Facing Job Interviews	Theory + Practical	2+2
	Discipline Specific Elective	GIM-VE-6016	Mobile & Web GIS	Theory + Practical	4+2
		GIM-VE-6026	Project Work – 2	Theory + Practical	4+2
		GIM - VE-6036	Internship – 2	Practical	6

**Total Credits in B. Voc. in Geoinformatics: 132 Credits**

## List of Papers

### B.Voc in Geoinformatics under CBCS

#### Core Papers

1. GIM-VC-1016 Fundamentals of Cartography
2. GIM -VC-1026 Fundamentals of Computers
3. GIM-VC-1036 Fundamentals of Geographic Information System (GIS)
4. GIM -VC-2016 Fundamentals of Remote Sensing (RS)
5. GIM -VC-2026 Fundamentals of Global Navigation Satellite System (GNSS)
6. GIM-VC-2036 Application & Scope of Geoinformatics
7. GIM -VC-3016 Field Survey Techniques in Geoinformatics
8. GIM -VC-3026 Digital Image Processing
9. GIM -VC-3036 On-Job Training
10. GIM -VC- 4016 Advanced GIS & Remote Sensing Techniques
11. GIM-VC-4026 Advanced Photogrammetry Techniques
12. GIM -VC-4036 On-Job Training

#### Skill Enhancement Papers

1. GIM-SE-3014 Fundamentals of Ecology & Wildlife Management  
(Any One) Fundamentals of Human Settlement & Urban Planning  
Fundamentals of Disaster Management
2. GIM-SE-4014 Fundamentals of Land & Wetland Management  
(Any One) Fundamentals of Water Resource Management  
Fundamentals of Agriculture & Soil Management
3. GIM-SE-5014 Spoken English & Personal Development
4. GIM-SE-6014 Writing Skills & Facing Job Interviews

#### Discipline Specific Elective Papers

1. GIM-VE-5016 Research Methodology
2. GIM-VE-5026 Project Work – 1
3. GIM-VE-5036 Internship - 1
4. GIM-VE-6016 Mobile & Web GIS
5. GIM-VE-6026 Project Work – 2
6. GIM -VE-6036 Internship – 2

#### Ability Enhancement Course Compulsory

1. ENG-AE-1014 English Communications
2. ENV-AE-2014 Environmental Science

**SEMESTER 1**  
**Paper GIM-VC-1016**  
**FUNDAMENTALS OF CARTOGRAPHY**  
**Total Marks: 100**  
**6 Credits**

<b>Objective:</b>	This paper emphasizes on understanding the fundamentals of Cartography and how to graphically symbolize, arrange, and present geographic data with the objective of laying the foundation for using maps as a component in Geoinformatics. At the completion of this course, students will understand the basics of data, to understand maps as a tool for data analysis and representation and to prepare maps using basic geographic data.	
<b>UNIT 1</b>	<b><i>Introduction to Cartography</i></b> Definition of Cartography History and Development, Importance, Nature & Scope Traditional Cartography & Geoinformatics Analogue vs Digital Cartography	<b><i>1 Credit</i></b> <b><i>(15 marks)</i></b>
<b>UNIT 2</b>	<b><i>Data &amp; Data Sources</i></b> Data in Cartography: Data & Types of Data Data Sources – Analogue and Digital Data Collection Techniques Traditional & Digital Methods of Handling and Compiling Data Conversion of Analogue Data to Digital Data	<b><i>1 Credit</i></b> <b><i>(15 marks)</i></b>
<b>UNIT 3</b>	<b><i>Visualizing Data through Maps</i></b> History of Mapping, Types of Maps, Elements of Map: Scale, Projections, Grids and Graticules Design and Symbolization in Map Making Map Layout and Production	<b><i>1 Credit</i></b> <b><i>(15 marks)</i></b>
<b>UNIT 4</b>	<b><i>Map Visualization &amp; Interpretation</i></b> Design aspects, Multiscale and geometric aspects scale, dissemination of (visualized) geospatial data, Data products, use and users of products, Various issues in map visualization Contours & Cross- Sections Conventional Symbols Map Interpretation Keys	<b><i>1 Credit</i></b> <b><i>(15 marks)</i></b>
<b>Practical Record</b>	A project file consisting of practical work on mapping and interpretation of maps and working with spatial data to generate maps using manual methods.	<b><i>1 Credit</i></b> <b><i>(20 marks)</i></b>
<b>Internal Assessment</b>	Submission of Assignment on given topic	<b><i>1 Credit</i></b> <b><i>(20 marks)</i></b>

**SEMESTER 1**  
**Paper GIM-VC-1026**  
**FUNDAMENTALS OF COMPUTERS**  
**Total Marks: 100**  
**6 Credits**

<b>Objective:</b>	This paper is aimed at providing the students with a basic knowledge base on computers – both hardware and software components. It is aimed at enabling students to operate a computer system in order to handle simple to complex functions. The objective is to lay a foundation for a student to use Geoinformatics comfortably in the later part of the course.	
<b>UNIT 1</b>	<b><i>Understanding Computers</i></b> History and Evolution Generations of Computers, Types of Computers Components of Computers	<b><i>1 Credit (15 marks)</i></b>
<b>UNIT 2</b>	<b>Components of Computers – Hardware</b> Hardware and their uses Number System Assembly of Computer System Cache and Virtual Memory Concept Network & IP Address	<b><i>1 Credit (15 marks)</i></b>
<b>UNIT 3</b>	<b>Components of Computers – Software</b> Installation of Software Open Source, Free & Commercial Software Operating Systems Application Software Computer Networks & Internet, GIS Software	<b><i>1 Credit (15 marks)</i></b>
<b>UNIT 4</b>	<b>Maintaining a Computer System</b> Hard Disk Tools: Disk Clean Up, Error Checking, De-Fragmentation, Computer Security Definition, Types of Security Threats, Different Threats Prevention Techniques. Computer Firewall, System Backup and Restore.	<b><i>1 Credit (15 marks)</i></b>
<b>Practical Record</b>	A project file consisting of practical work on Assembly and maintenance of computer systems, accessing and installation of operating system and application software	<b><i>1 Credit (20 marks)</i></b>
<b>Internal Assessment</b>	Submission of Assignment on given topic	<b><i>1 Credit (20 marks)</i></b>

**SEMESTER 1**  
**Paper GIM-VC-1036**  
**FUNDAMENTALS OF GEOGRAPHIC INFORMATION SYSTEM (GIS)**  
**Total Marks: 100**  
**6 Credits**

<b>Objective:</b>	This paper is aimed at providing the students with a basic knowledge base on the science of Geographic Information System (GIS). It will help students understand basics of GIS for developing an interest in the principles, practical uses, and resources related to geospatial technologies.	
<b>UNIT 1</b>	<b><i>Introduction to GIS</i></b> Definition, History and Development of GIS, Significance of GIS Basic Components and Approaches, Data Sources Hardware & Software Requirements	<b><i>1 Credit</i></b> <b><i>(15 marks)</i></b>
<b>UNIT 2</b>	<b><i>Spatial Data:</i></b> Types of data and data models (Raster and Vector and their advantages and disadvantages) Data source and acquisition (Scanners and Digitization - manual and automated), Data Structure, Compression and File formats (Raster and Vector), Topological and Non-topological Vector data, Database Management systems, Data errors and uncertainties and their sources, Spatial Data Quality – Accuracy, resolution, consistency, completeness Attribute Data Management, Big-Data.	<b><i>1 Credit</i></b> <b><i>(15 marks)</i></b>
<b>UNIT 3</b>	<b><i>Data Visualization and Analysis:</i></b> Spatial data analysis – Concept and definition, Types of Spatial Analysis (Queries and reasoning, measurements, transformations, descriptive summaries, optimization, hypothesis testing), Location and spatial relationships, Raster data pre-processing, Vector data analysis – Buffering, Geographic relationship, Overlay analysis, Spatial interpolation and prediction.	<b><i>1 Credit</i></b> <b><i>(15 marks)</i></b>
<b>UNIT 4</b>	<b><i>Application of GIS</i></b> Ecology, Environment & Wildlife Conservation Natural Resource Management Disaster Management Land Management Agriculture Urban Planning	<b><i>1 Credit</i></b> <b><i>(15 marks)</i></b>
<b>Practical Record</b>	A project file consisting of practical work on GIS and its Application	<b><i>1 Credit</i></b> <b><i>(20 marks)</i></b>
<b>Internal Assessment</b>	Submission of Assignment on given topic	<b><i>1 Credit</i></b> <b><i>(20 marks)</i></b>



**SEMESTER 2**  
**Paper GIM-VC-2016**  
**FUNDAMENTALS OF REMOTE SENSING (RS)**  
**Total Marks: 100**  
**6 Credits**

<b>Objective:</b>	This paper is aimed at providing the students with a basic knowledge base on the science of Remote Sensing (RS). It will help students understand basics of RS sciences for developing an interest in the principles, practical uses, and resources related to Geoinformatics with respect to remote sensing sciences.	
<b>UNIT 1</b>	<b><i>Introduction to Remote Sensing</i></b> History and Development, Definition, concepts and principles, Components of Remote sensing, Types of remote sensing, Data Sources Hardware & Software Requirements	<b><i>1 Credit (15 marks)</i></b>
<b>UNIT 2</b>	<b><i>Electro Magnetic Radiation (EMR)</i></b> Electro Magnetic Radiation (EMR) and its characteristics, Interaction of EMR with atmosphere and Earth's surface – Absorption, Scattering, Reflection, Atmospheric windows and their significance, Spectral Signatures,	<b><i>1 Credit (15 marks)</i></b>
<b>UNIT 3</b>	<b><i>Remote Sensing Resolutions &amp; Sensors</i></b> Spatial, Spectral, Temporal and Radiometric Resolution Different types of satellites and their characteristics, Sensor classifications and specifications, Commonly used remote sensing satellite systems, Introduction to Thermal and Microwave remote sensing	<b><i>1 Credit (15 marks)</i></b>
<b>UNIT 4</b>	<b><i>Application of Remote Sensing</i></b> Ecology, Environment & Wildlife Conservation Natural Resource Management Disaster Management Land Management Agriculture Urban Planning	<b><i>1 Credit (15 marks)</i></b>
<b>Practical Record</b>	A project file consisting of practical work on Remote Sensing and its Application	<b><i>1 Credit (20 marks)</i></b>
<b>Internal Assessment</b>	Submission of Assignment on given topic	<b><i>1 Credit (20 marks)</i></b>

**SEMESTER 2**  
**Paper GIM-VC-1026**  
**FUNDAMENTALS OF GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS)**  
**Total Marks: 100**  
**6 Credits**

<b>Objective:</b>	This paper is aimed at providing the students with a basic knowledge base on the science of Global Navigation Satellite System (GNSS). It will help students understand basics of GNSS & GPS technology for developing an interest in the principles, practical uses, and resources related to Geoinformatics with respect to GNSS.	
<b>UNIT 1</b>	<b><i>Introduction to GNSS</i></b> Introduction to GNSS, History, Satellite Navigations constellations–GPS system, GPS signals and data, Geopositioning-Basic Concepts. Different kinds of Navigation Systems	<b><i>1 Credit (15 marks)</i></b>
<b>UNIT 2</b>	<b><i>Indian Satellite Navigation</i></b> Indian Regional Navigation Satellite System, GPS Aided GEO Augmented Navigation (GAGAN) :Technology and Applications, NaviC and its Applications	<b><i>1 Credit (15 marks)</i></b>
<b>UNIT 3</b>	<b><i>Surveying</i></b> DGPS-GPS data processing and Accuracy. Planning a GPS Survey, Positioning methods – point positioning, relative positioning, Static, Fast static, RTK, Differential Data Processing: Accuracy measures, software modules, GIS and GPS data integration	<b><i>1 Credit (15 marks)</i></b>
<b>UNIT 4</b>	<b><i>Application of GPS</i></b> Future of GPS: Modernization plans of navigational satellites, Hardware and software improvements, Selection of Reference Station, Reference Station Equipment: GPS Application in Surveying and Mapping, Navigation Military, Location Based Services, Vehicle tracking.	<b><i>1 Credit (15 marks)</i></b>
<b>Practical Record</b>	A project file consisting of practical work on GNSS and its Application	<b><i>1 Credit (20 marks)</i></b>
<b>Internal Assessment</b>	Submission of Assignment on given topic	<b><i>1 Credit (20 marks)</i></b>

**SEMESTER 2**  
**Paper GIM-VC-2036**  
**APPLICATION & SCOPE OF GEOINFORMATICS**  
**Total Marks: 100**  
**6 Credits**

<b>Objective:</b>	This paper is aimed at providing the students a framework for understanding the application and scope of Geoinformatics as a discipline through incorporating theory and practical components	
<b>UNIT 1</b>	<b><i>Geoinformatics &amp; Natural Resource Management</i></b> GIS & RS data sources for NRM Wildlife Surveys Protected Area Management Land Change Assessment in Forest Areas Flood Hazard Mapping Watershed Delineation Soil Type Assessment Soil Erosion Mapping Mapping of Forest Fires	<b>2 Credit (30 marks)</b>
<b>UNIT 2</b>	<b><i>Geoinformatics &amp; Agricultural Management</i></b> GIS & RS data sources for Agricultural Studies Mapping of Agricultural Zones Mapping Ground & Underground Water Sources Crop Health Assessment Crop Yield Assessment & Prediction Mapping	<b>1 Credit (15 marks)</b>
<b>UNIT 3</b>	<b><i>Geoinformatics Urban Areas Management</i></b> GIS & RS data sources for Urban Planning Collection of data for regional planning Trend analysis: change detection Regional mapping: scale and resolution Regional and Urban land use change	<b>1 Credit (15 marks)</b>
<b>Practical Record</b>	A project file consisting of use of Field Survey Tools and their Applications	<b>1 Credit (20 marks)</b>
<b>Internal Assessment</b>	Submission of Assignment on given topic	<b>1 Credit (20 marks)</b>

**SEMESTER 3**  
**Paper GIM-VC-3016**  
**FIELD SURVEY TECHNIQUES IN GEOINFOMATICS**  
**Total Marks: 100**  
**6 Credits**

<b>Objective:</b>	This paper is aimed at providing the students with advanced knowledge base on conduct of field surveys using traditional as well as advanced digital survey tools.	
<b>UNIT 1</b>	<b><i>Fundamentals of Surveying</i></b> Meaning and importance; Principles of surveying - plane and geodetic surveying; Principles of triangulation. Levelling	<b><i>1 Credit</i></b> <b><i>(15 marks)</i></b>
<b>UNIT 2</b>	<b><i>Principles and techniques of surveying</i></b> Chain Survey Techniques Plane Table, Prismatic Compass. Principles of radiation, intersection, traversing, contouring and levelling. Principles & utilities in surveying using Advanced Survey Tools Theodolite, Dumpy Level, Total Station	<b><i>1 Credit</i></b> <b><i>(15 marks)</i></b>
<b>UNIT 3</b>	<b><i>Drone-based Field Surveys</i></b> Drones as survey tools Software & Hardware Requirements Flying Paths & Control Points 2D/3D Data Collection Pre-Flight Inspection and Flight Planning Post-Flight Data Processing & Analysis	<b><i>1 Credit</i></b> <b><i>(15 marks)</i></b>
<b>UNIT 4</b>	<b><i>LiDAR</i></b> Principles of LiDAR Surveys Types of LiDar –Aerial, Mobile & Terrestrial Data Sources & Prerequisites of LiDAR Surveys Applications of LiDAR Surveys	<b><i>1 Credit</i></b> <b><i>(15 marks)</i></b>
<b>Practical Record</b>	A project file consisting of use of Field Survey Tools and their Applications	<b><i>1 Credit</i></b> <b><i>(20 marks)</i></b>
<b>Internal Assessment</b>	Submission of Assignment on given topic	<b><i>1 Credit</i></b> <b><i>(20 marks)</i></b>

**SEMESTER 3**  
**Paper GIM-VC-3026**  
**DIGITAL IMAGE PROCESSING**  
**Total Marks: 100**  
**6 Credits**

<b>Objective:</b>	This paper is aimed at providing the students with advanced knowledge base on advanced digital image processing techniques using both open source and commercial image processing software.	
<b>UNIT 1</b>	<b>Low – level processing</b> History of Digital Image Processing and Photography, Digital images and their characteristics, Formation of a digital image, Digital signals, Pixels, Types of images, Purpose of Image processing, Look-Up Tables (LUT), True colour images and FCC, Image distortions and their sources, Noise removal, Geometric and radiometric corrections.	<b>1 Credit (15 marks)</b>
<b>UNIT 2</b>	<b>Mid – level Processing</b> Spatial enhancement Techniques, Contrast stretching: Linear and Non-linear methods and image restoration, Image sharpening, Histogram equalisation, Histogram Stretching, Reprojection, Convolution Filtering – Low pass filter, High pass Filter, Image smoothing, Edge enhancement and edge detection, Gradient filters, Directional and non-directional filtering.	<b>1 Credit (15 marks)</b>
<b>UNIT 3</b>	<b>High – level Processing</b> Wavelets and multi-resolution processing, Image compression, Image Segmentation, Object Recognition, Unsupervised and Supervised classification.	<b>1 Credit (15 marks)</b>
<b>UNIT 4</b>	<b>Advanced Image Analysis</b> Multi dated data analysis and Change detection Concept of Pattern Recognition, Multi-spectral pattern recognition Spectral discrimination, Signature bank, Parametric and Non-Parametric classifiers Accuracy assessment techniques Principles of Object-based Classification Techniques	<b>1 Credit (15 marks)</b>
<b>Practical Record</b>	A project file consisting Image Processing using Open Source or Commercial Image Processing Software	<b>1 Credit (20 marks)</b>
<b>Internal Assessment</b>	Submission of Assignment on given topic	<b>1 Credit (20 marks)</b>

**SEMESTER 3**  
**Paper GIM-VC-3036**  
**ON-JOB TRAINING**  
**Total Marks: 100**  
**6 Credits**

<b>Objective:</b>	This paper is aimed at providing the students with an opportunity to work in a professional environment and develop skills related to the relevant course components.	
	<b>On-Job Training</b>	<b><i>4 Credit (60 marks)</i></b>
	<b>Report Submission</b>	<b><i>1 Credit (20 marks)</i></b>
	<b>Viva</b>	<b><i>1 Credit (20 marks)</i></b>

**SEMESTER 3**  
**Paper GIM-VC-3XX4**  
**FUNDAMENTALS OF ECOLOGY & WILDLIFE MANAGEMENT**  
**(Optional 1)**  
**Total Marks: 100**  
**4 Credits**

<b>Objective:</b>	This paper is aimed at providing the students with fundamental knowledge base on theoretical framework and issues pertaining to Ecology and Wildlife Management	
<b>UNIT 1</b>	<b><i>Basics of Ecology &amp; Biodiversity</i></b> Definition, Nature & Scope, Types of Ecology, Habitat and Ecological niche, Ecological community, Ecological succession, Components of Ecosystem, Energy Flow, Natural Cycles, Biodiversity– types, classification, functions, hotspots, Animal and Plant Diversity, Threats to biodiversity, Global and national and local initiatives in biodiversity conservation. Climate change – impacts and mitigation, Environmental Impact Assessment (EIA), Various Government Acts	<b><i>1 Credit (15 marks)</i></b>
<b>UNIT 2</b>	<b><i>Geoinformatics and Ecology &amp; Biodiversity Conservation</i></b> Structure of leaf - Spectral behaviour of leaf – Vegetation indices – NDVI, TVI, SVI, PCA – Vegetation classification and mapping - Estimation of Leaf area index, Biomass estimation – Estimation of terrestrial carbon assimilation in forests , Wildlife Survey Techniques, Protected Areas, Wildlife Habitat & Corridor Management, Role of Geoinformatics in Biodiversity & Wildlife Management, Forest type and density mapping and forest stock mapping using RS technique	<b><i>1 Credit (15 marks)</i></b>
<b>Practical Record</b>	A project file consisting of Case Study on Local Ecology & Biodiversity Conservation Issue	<b><i>1 Credit (20 marks)</i></b>
<b>Internal Assessment</b>	Submission of Assignment on given topic	<b><i>1 Credit (20 marks)</i></b>

**SEMESTER 3**  
**Paper GIM-VC-3XX4**  
**FUNDAMENTALS OF HUMAN SETTLEMENT & URBAN PLANNING**  
**(Optional 2)**  
**Total Marks: 100**  
**4 Credits**

<b>Objective:</b>	This paper is aimed at providing the students with fundamental knowledge base on theoretical framework and issues pertaining to Urban landscape and Urban Planning	
<b>UNIT 1</b>	<b><i>Human Settlement &amp; Urban Planning</i></b> Sites and situations of settlements, types and patterns of settlements, hierarchy of settlements, urban settlements – characteristics, factors of growth, land-use zones, Central Business District (CBD), Rural – urban fringe, Role of Geoinformatics in Human Settlement assessment, Urbanization – hierarchy, urban land use, urban growth, urban sprawl – effects and causes, problems of urban areas – causes and possible solutions, effects of urbanization on people and natural environment, Fundamental problems of city, Role of RS and GIS in urban planning	<b><i>1 Credit</i></b> <b><i>(15 marks)</i></b>
<b>UNIT 2</b>	<b><i>Application of Geoinformatics in Urban Planning</i></b> Large scale mapping for cadastral database, traffic and parking surveys, urban land use classification, monitoring, change detection analysis, utility planning, integrated development planning, urban conservation, transportation planning and Land Information System, Remote Sensing applications on Urban landscape Population estimates, housing quality studies, site selection processes, traffic and parking studies,	<b><i>1 Credit</i></b> <b><i>(15 marks)</i></b>
<b>Practical Record</b>	A project file consisting of Case Study on Local Urban Planning Issue	<b><i>1 Credit</i></b> <b><i>(20 marks)</i></b>
<b>Internal Assessment</b>	Submission of Assignment on given topic	<b><i>1 Credit</i></b> <b><i>(20 marks)</i></b>



**SEMESTER 3**  
**Paper GIM-VC-3XX4**  
**FUNDAMENTALS OF DISASTER MANAGEMENT**  
**(Optional 3)**  
**Total Marks: 100**  
**4 Credits**

<b>Objective:</b>	This paper is aimed at providing the students with fundamental knowledge base on theoretical framework and issues pertaining to Disasters, Vulnerability, Risks and their Management	
<b>UNIT 1</b>	<b><i>Introduction to Disaster Management</i></b> Disaster, Types, Meaning, nature scope and dimensions of Disaster Management, Natural and Man-made disasters – Nature and Scope, Principles of disaster management, Disaster Management Cycle, Disaster management policies, National and state bodies of disaster management, early warning systems, training and drills for disaster preparedness, awareness generation programme, usage of GIS and RS in disaster management	<b><i>1 Credit (15 marks)</i></b>
<b>UNIT 2</b>	<b><i>Disaster Mitigation using Geoinformatics</i></b> Remote Sensing techniques - Monitoring atmosphere constituents- air pollution - industrial activity, modelling using GIS. Spectral characteristics of water- classification of water quality -Data base creation and quality modeling using GIS. Aquifer Vulnerability -Intrinsic and specific vulnerability- contaminant transport model. Environmental satellites Monitoring land, water, atmosphere and ocean using Remote Sensing Data. Spectral characteristics of soil- Soil formation- classification of soils- soil survey interpretation and mapping- impact of agricultural and industrial activity on soil properties. RS & GIS in assessing Soil salinity- alkalinity- water logging studies- soil erosion	<b><i>1 Credit (15 marks)</i></b>
<b>Practical Record</b>	A project file consisting of Case Study on Local Disaster Management Issue	<b><i>1 Credit (20 marks)</i></b>
<b>Internal Assessment</b>	Submission of Assignment on given topic	<b><i>1 Credit (20 marks)</i></b>

**SEMESTER 4**  
**Paper GIM-VC-4016**  
**ADVANCED GIS & REMOTE SENSING TECHNIQUES**  
**Total Marks: 100**  
**6 Credits**

<b>Objective:</b>	This paper is aimed at providing the students with advanced knowledge base on conduct of field surveys using traditional as well as advanced digital survey tools.	
<b>UNIT 1</b>	<b>Advanced GIS Techniques</b> DEM/DTM generation and analysis, Network Analysis, Numerical Spatial Data Analysis – smoothing, clustering and associations, Spatial autocorrelation, Spatial Modelling, Multiple-Criteria Decision Making in Spatial Data Analysis, Principles of AHP, Trend surface analysis, Thiessen Polygons, Regression Models, Principal Component Analysis, Cluster analysis, Band Rationing.	<b>1 Credit (15 marks)</b>
<b>UNIT 2</b>	<b>Advanced Rs Techniques:</b> Analysis of spectral response patterns – Soil, Water, Vegetation, Ice and Snow, Grass, Ground truthing – importance, methods and equipment, Vegetation and Soil Indices, Object Oriented Classification, Automated Orthorectification of Historical images, Long Wave Infrared Polarization, Passive Imaging polarimetry, Hyper spectral Image processing, RS applications in Agriculture, Forestry, Water Resources, Disaster Management and Hazard Zone mapping, Land Use Planning, Natural Resources Monitoring, Weather forecasting, Solid waste Management, Navigation projects, Traffic and Road control	<b>1 Credit (15 marks)</b>
<b>UNIT 3</b>	<b>Thermal RS:</b> Concept and scope, Spectral range in thermal RS, Radiation Principles, Emissivity, Kinetic temperature and Radiant Temperature, Black body radiation, Brightness temperature, Thermal Properties of materials, Thermal Sensors and Radiometers, Data acquisition, Characteristics of Infrared images, Spatial resolution and geometric correction, Effects of weather on the images, Interpretation of Thermal images, Advantages and disadvantages of thermal RS.	<b>1 Credit (15 marks)</b>
<b>UNIT 4</b>	<b>Microwave RS:</b> Introduction and History of Microwave RS, Microwave part of EMR, Understanding Microwave signatures and bands, Types of microwave Remote Sensors and their characteristics, Interaction between microwaves and earth's surface, Principles and Applications of Microwave RS, Altimeters, Imaging RADARs and Scatterometers, SAR, Radiometers, Microwave antennas, Advantages and disadvantages, Different Microwave sensors currently operating and their characteristics.	<b>1 Credit (15 marks)</b>
<b>Practical Record</b>	A project file consisting of use of Advanced GIS & Remote Sensing Tools & Techniques	<b>1 Credit (20 marks)</b>
<b>Internal Assessment</b>	Submission of Assignment on given topic	<b>1 Credit (20 marks)</b>

**SEMESTER 4**  
**Paper GIM-VC-4026**  
**ADVANCED PHOTOGRAMMETRY & STATISTICAL TECHNIQUES**  
**Total Marks: 100**  
**6 Credits**

<b>Objective:</b>	This paper is aimed at providing the students with advanced knowledge pertaining to Photogrammetry as a Tool for spatial data collection and analysis along with giving the students an overview on Advanced Statistical Techniques applicable in Geoinformatics	
<b>UNIT 1</b>	<b><i>Fundamentals of Aerial Photography</i></b> Fundamentals of aerial photography, Vertical and Oblique aerial photography, Aerial cameras, Photogrammetry; Basic concepts of scale, object height and length, object area and perimeter, grayscale tone/color of objects, Photo interpretation techniques, Stereo photogrammetry and stereovision, Parallax bar and its applications. Stereo Photogrammetry: Stereovision & Stereoscopes, Stereoscopic Parallax & Parallax Equations	<b><i>1 Credit (15 marks)</i></b>
<b>UNIT 2</b>	<b><i>Digital Photogrammetry</i></b> Model deformation & Rectification, Relief displacement, Vertical exaggeration, Triangulation, Control & Mapping. Digital Terrain Model (DTM/DEM)	<b><i>1 Credit (15 marks)</i></b>
<b>UNIT 3</b>	<b><i>Spatial Analysis Modelling: Proximity</i></b> Buffer; Topography - Digital Elevation Model, Slope, Aspect, Hillshade, and View shed; Watershed and Morphometric – Stream order, Flow Direction, Flow Accumulation, Watershed delineation, bifurcation ratio; Network analysis – shortest path, service area, closest facility, location and allocation; Interpolation and Extrapolation – Kriging, IDW, Spline, Trend, Natural neighbour, Thiessen polygon, topo to raster.	<b><i>1 Credit (15 marks)</i></b>
<b>UNIT 4</b>	<b><i>Spatial Statistical Modelling</i></b> Identification of Central feature, directional distribution, mean centre, median centre, linear directional mean, standard distance, hot-spot analysis, correlation, raster calculator and Boolean operation	<b><i>1 Credit (15 marks)</i></b>
<b>Practical Record</b>	A project file consisting of use of Advanced Photogrammetry and Statistics in Geoinformatics	<b><i>1 Credit (20 marks)</i></b>
<b>Internal Assessment</b>	Submission of Assignment on given topic	<b><i>1 Credit (20 marks)</i></b>

**SEMESTER 4**  
**Paper GIM-VC-4036**  
**ON-JOB TRAINING**  
**Total Marks: 100**  
**6 Credits**

<b>Objective:</b>	This paper is aimed at providing the students with an opportunity to work in a professional environment and develop skills related to the relevant course components.	
	<b>On-Job Training</b>	<b>4 Credit (60 marks)</b>
	<b>Report Submission</b>	<b>1 Credit (20 marks)</b>
	<b>Viva</b>	<b>1 Credit (20 marks)</b>

**SEMESTER 4**  
**Paper GIM-VC-4XX4**  
**FUNDAMENTALS OF LAND & WETLAND MANAGEMENT**  
**(Optional 1)**  
**Total Marks: 100**  
**4 Credits**

<b>Objective:</b>	This paper is aimed at providing the students with basic knowledge framework on management of land and wetlands as a natural resource	
<b>UNIT 1</b>	Land as a resource. Dry land, land use classification, land use planning, Soil Loss. Land resource management and major issues. Geological and Geo-technical studies: Mineral resources exploration, mineral mapping and mineral resources information system, mapping mining area, encroachment mapping, GIS in mine remediation and mine reclamation, oil and gas exploration, site suitability for dams, atomic power plants. Elements of structure, functions and processes in fresh water (lakes and rivers), marine and estuarine ecosystems with respect to hydrology, and biodiversity; wetland soils types and redox potential; energy flow in aquatic ecosystems; stratification and zonation in rivers, lakes and oceans with respect to light, temperature, and pressure. Biological adaptations in plant and animals.	<b>1 Credit (15 marks)</b>
<b>UNIT 2</b>	Land Use Land Cover mapping, Natural Resources Census, wetland mapping, land/soil degradation mapping, sand cast mapping, soil conservation measures, soil erosion modelling, land capability maps, land/soil irrigability maps. Landscape ecological concepts; ecological restoration of fresh water and coastal ecosystems. Coastal regulation zone, International conventions & protocols: Ramsar Convention, Convention on Biological Diversity, Ramsar sites in India. Remote sensing and GIS in aquatic ecosystem management, biodiversity conservation, climate change and aquatic ecosystem response	<b>1 Credit (15 marks)</b>
<b>Practical Record</b>	A project file consisting of issues on Land and Wetland Management	<b>1 Credit (20 marks)</b>
<b>Internal Assessment</b>	Submission of Assignment on given topic	<b>1 Credit (20 marks)</b>

**SEMESTER 4**  
**Paper GIM-VC-4XX4**  
**FUNDAMENTALS OF WATER RESOURCE MANAGEMENT**  
**(Optional 2)**  
**Total Marks: 100**  
**4 Credits**

<b>Objective:</b>	This paper is aimed at providing the students with fundamental knowledge on water as natural resource by addressing issues of crisis and management	
<b>UNIT 1</b>	<b><i>Hydrology &amp; Water Resource Management</i></b> Hydrologic cycle, Basin Hydrology, Surface and Ground Water Resources, Water Balance, Runoff estimation in the basin and factors controlling runoff; Rainfall-runoff relationship, Flood Frequency Analysis (Plotting Position Method, Log Pearson Type III, Gumbel's Extreme Value Distribution), Hydrograph analysis. Planning Concepts and Definitions, Aim of Water Resources Planning, Levels of Water Resources Planning, Measurement of Objectives, Function and Role of Water Resources, Risk and Uncertainty, Phases of Water Resources Planning, Data Requirements for Water Resources Planning.	<b><i>1 Credit (15 marks)</i></b>
<b>UNIT 2</b>	<b><i>Irrigation and Watershed</i></b> Water indices (NDWI, NDDI, SPI), HEC-RAS model, RUSLE model, Hydrology modelling – Watershed delineation and management, Terrain and flow modelling, Inundation modelling, Risk modelling, EIA, Groundwater monitoring and potential site suitability, Water quality analysis, Flood hazard management modelling, Runoff computation, Soil moisture evaluation, Site suitability for water harvesting, Groundwater quality analysis, Drought monitoring and management, Irrigation area Identification, Forecasting – Storm-flood forecasting, runoff forecasting, water supply and demand forecasting, soil moisture forecasting, Evapotranspiration monitoring	<b><i>1 Credit (15 marks)</i></b>
<b>Practical Record</b>	A project file consisting on issue on Water Resource Management	<b><i>1 Credit (20 marks)</i></b>
<b>Internal Assessment</b>	Submission of Assignment on given topic	<b><i>1 Credit (20 marks)</i></b>

**SEMESTER 4**  
**Paper GIM-VC-4XX4**  
**FUNDAMENTALS OF AGRICULTURE & SOIL MANAGEMENT**  
**(Optional 3)**  
**Total Marks: 100**  
**4 Credits**

<b>Objective:</b>	This paper is aimed at providing the students with knowledge on fundamentals of agriculture and management of soil resource vis-à-vis agricultural component	
<b>UNIT 1</b>	Identification of crops -acreage estimation -production forecasting - pests and disease attacks through remote sensing -crop stress detection due to flood and drought - catchments and command area monitoring. Agro-climatic zonation, site suitability for agricultural and horticulture crops, crop acreage estimation, RS based yield model, crop norm violation, RS basis for crop insurance claim, damage assessment due to cyclone, drought, flood and forewarning, crop stress detection, precision agriculture.	<b>1 Credit (15 marks)</b>
<b>UNIT 2</b>	Applications in soil: Soil and Land Use Surveys, Soil classification, soil irrigability, soil erosion mapping, soil salinity, soil alkalinity, surface soil moisture estimation, runoff and sediment yield estimation, sand casting mapping, soil fertility mapping, agro-land suitability assessment, soil capability and loss assessment, locational and climatic advantages, settlements and demographic pressure estimation.	<b>1 Credit (15 marks)</b>
<b>Practical Record</b>	A project file consisting of topic on Agriculture and Soil Management Issues	<b>1 Credit (20 marks)</b>
<b>Internal Assessment</b>	Submission of Assignment on given topic	<b>1 Credit (20 marks)</b>

**SEMESTER 5**  
**Paper GIM-VC-5XX4**  
**SPOKEN ENGLISH & PERSONAL DEVELOPMENT**  
**Total Marks: 100**  
**4 Credits**

<b>Objective:</b>	This paper is aimed at providing the students with skills pertaining to English Phonetics and Personality Development and Grooming to enable them to face job interviews	
<b>UNIT 1</b>	<p><b><i>Basic Phonetics</i></b>  Consonants and Vowel Sounds.  Phoneme &amp; syllable - Definition and Scope, Speech Mechanism: An introduction  Description of Human vocal organs: Active &amp; Passive Articulators. Phonemes and syllables, Consonants of English- Definition and Description w.r.t. to Tongue Lips and soft plate position.  Classification - Pure Vowel/monophthongs, Vowel Glides /Diphthongs, Phonetic transcription using IPA symbols – words, features of connected speech, Spelling patterns of English. Improving Handwriting skills.</p>	<b><i>1 Credit (15 marks)</i></b>
<b>UNIT 2</b>	<p><b><i>Personality Development and Self Grooming</i></b>  Attitude - Concept - Ways to develop positive attitude - Differences between personalities having positive and negative attitude. Importance of self- motivation- Factors leading to de-motivation, Do's and Don'ts to develop positive self-esteem, Defining the difference between aggressive, submissive and assertive behaviours. Body language - Problem-solving - Conflict and Stress Management - Decision-making skills, Leadership and qualities of a successful leader – Character building - Team-work – Time management - Work ethics –Good manners and etiquette.</p>	<b><i>1 Credit (15 marks)</i></b>
<b>Practical Record</b>	A project file consisting of Spoken English and Personality Development	<b><i>1 Credit (20 marks)</i></b>
<b>Internal Assessment</b>	Submission of Assignment and Viva	<b><i>1 Credit (20 marks)</i></b>



**SEMESTER 5**  
**Paper GIM-VC-5016**  
**RESEARCH METHODOLOGY**  
**Total Marks: 100**  
**6 Credits**

<b>Objective:</b>	This course is designed for field methods, to practice and apply in research and work related to it. Students may use qualitative and quantitative research methods to improve their performance in participatory methodologies.	
<b>UNIT 1</b>	<b><i>Foundations of Research</i></b> Meaning, Objectives, Types, Motivation, Utility. Concept of theory, empiricism, deductive and inductive theory. Characteristics of scientific method – Understanding the language of research – Concept, Construct, Definition, Variable. Research Question, Hypothesis, Hypothesis. Hypothesis Testing – Logic & Importance, Concept of Independent & Dependent variables	<b><i>1 Credit (15 marks)</i></b>
<b>UNIT 2</b>	<b><i>Sampling</i></b> Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size, Non Response. Characteristics of a good sample. Probability Sample – Simple Random Sample, Systematic Sample, Stratified Random Sample & Multi-stage sampling. Determining size of the sample – Practical considerations in sampling and sample size.	<b><i>1 Credit (15 marks)</i></b>
<b>UNIT 3</b>	<b><i>Data Analysis</i></b> Data Preparation – Univariate analysis (frequency tables, bar charts, pie charts, percentages), Bivariate analysis – Cross tabulations and Chi-square test including testing hypothesis of association	<b><i>1 Credit (15 marks)</i></b>
<b>UNIT 4</b>	<b><i>Interpretation of Data and Paper Writing</i></b> Layout of a Research Paper, Journals in Computer Science, Impact factor of Journals, When and where to publish ? Ethical issues related to publishing, Plagiarism and Self-Plagiarism.	<b><i>1 Credit (15 marks)</i></b>
<b>Practical Record</b>	A project file consisting of use of Research Methodology in Real-World Problem Solving Techniques	<b><i>1 Credit (20 marks)</i></b>
<b>Internal Assessment</b>	Submission of Assignment on given topic	<b><i>1 Credit (20 marks)</i></b>

**SEMESTER 5**  
**Paper GIM-VC-5026**  
**PROJECT WORK - 1**  
**Total Marks: 100**  
**6 Credits**

<b>Objective:</b>	This paper is aimed at providing the students with an opportunity to work in a professional environment and develop skills related to the relevant course components. Project work, which is a major project of 1 whole semester or about 24 weeks, on a larger, manageable program of research, requiring a report of 200 pages including maps and diagrams and tables and text.	
	<b>Project Work on an Assigned Topic using Geoinformatics as a core tool for investigation</b>	<b>4 Credit (60 marks)</b>
	<b>Report Submission</b>	<b>1 Credit (20 marks)</b>
	<b>Viva</b>	<b>1 Credit (20 marks)</b>

**SEMESTER 5**  
**Paper GIM-VC-5036**  
**INTERNSHIP TRAINING - 1**  
**Total Marks: 100**  
**6 Credits**

<b>Objective:</b>	This paper is aimed at providing the students with an opportunity to work in a professional environment and develop skills related to the relevant course components. Internships are done in a Government, research and implementation institution and / or a Private, Corporate institution of repute with specialization on the technologies of cartography, remote sensing, GIS and GPS, including Computer work in a prestigious lab.	
	<b>Internship on Any One of the Following Topics</b> <b>a. Ecology &amp; Wildlife Management</b> <b>b. Rural Planning / Urban Planning</b> <b>c. Disaster Management</b>	<b>4 Credit</b> <b>(60 marks)</b>
	<b>Report Submission</b>	<b>1 Credit</b> <b>(20 marks)</b>
	<b>Viva</b>	<b>1 Credit</b> <b>(20 marks)</b>

**SEMESTER 6**  
**Paper GIM-VC-6XX4**  
**WRITING SKILLS & FACING JOB INTERVIEWS**  
**Total Marks: 100**  
**4 Credits**

<b>Objective:</b>	This paper is aimed at providing the students with skills pertaining to writing skills and skills to enable them to face job interviews	
<b>UNIT 1</b>	<b><i>Writing Skill Development</i></b> Composing simple paragraph-Ordering information in a logical manner (coherence). Essay Writing -Argumentative, Narrative, Descriptive, Imaginative. Writing Letters to the Editors and Advertisement Writing Welcome Speech & Vote of Thanks. Writing Project Proposals	<b><i>1 Credit (15 marks)</i></b>
<b>UNIT 2</b>	<b><i>Preparing for Job Interviews</i></b> Resume building The art of participating in Group Discussion Facing the Personal (HR & Technical) Interview Preparation for the Frequently Asked Questions Mock Interview Sessions.	<b><i>1 Credit (15 marks)</i></b>
<b>Practical Record</b>	A project file consisting of Practical on Writing Skills and Interview Skills	<b><i>1 Credit (20 marks)</i></b>
<b>Internal Assessment</b>	Submission of Assignment and Viva	<b><i>1 Credit (20 marks)</i></b>

**SEMESTER 5**  
**Paper GIM-VC-5016**  
**MOBILE & WEB GIS**  
**Total Marks: 100**  
**6 Credits**

<b>Objective:</b>	This paper is aimed at providing the students with advanced knowledge on scope, usage and applicability of mobiles and interned as a platform for GIS	
<b>UNIT 1</b>	<b><i>Introduction to Mobile GIS</i></b> Definitions – Mobile GIS, Mobile Web GIS, Native App, Hybrid App, Wireless Application Protocol (WAP), Mobile client, User interface, Augmented reality, Evolution of ICT, GIS and Mobile GIS, Types of Mobile GIS, Limitations and challenges in Mobile GIS, Privacy in Mobile GIS	<b><i>1 Credit</i></b> <b><i>(15 marks)</i></b>
<b>UNIT 2</b>	<b><i>Mobile GIS Architecture</i></b> Components of Mobile GIS – Wireless network, mobile device, Mobile OS, Mobile GIS software, Geospatial data, GPS position, Special applications, Mobile server components – web engine, map engine and data engine, Mobile clients.	<b><i>1 Credit</i></b> <b><i>(15 marks)</i></b>
<b>UNIT 3</b>	<b><i>Mobile GIS Applications and Development</i></b> Different Mobile GIS apps, Mobile GIS programming, Mobile acquisition of geospatial data, Intelligent landmark for mobile GIS, Intelligent Transportation Systems (ITS), Knowledge transfer through mobile GIS. Mobile GIS app development depending on – user requirements, mobile devices and associated OS, Programming proficiency, Mobile app type.	<b><i>1 Credit</i></b> <b><i>(15 marks)</i></b>
<b>UNIT 4</b>	<b><i>Application of Mobile GIS</i></b> Disaster response and management, agriculture, public health, forestry, law enforcement and crime control, navigation and tourism, survey and inventory, Smart cities, Web-GIS Portals: Google Earth Engine, Bhuvan, Mosdaik, VedaS	<b><i>1 Credit</i></b> <b><i>(15 marks)</i></b>
<b>Practical Record</b>	A project file consisting of use of Mobile & Web Based GIS Applications	<b><i>1 Credit</i></b> <b><i>(20 marks)</i></b>
<b>Internal Assessment</b>	Submission of Assignment on given topic	<b><i>1 Credit</i></b> <b><i>(20 marks)</i></b>

**SEMESTER 6**  
**Paper GIM-VC-6026**  
**PROJECT WORK - 2**  
**Total Marks: 100**  
**6 Credits**

<b>Objective:</b>	This paper is aimed at providing the students with an opportunity to work in a professional environment and develop skills related to the relevant course components. Project work, which is a major project of 1 whole semester or about 24 weeks, on a larger, manageable program of research, requiring a report of 200 pages including maps and diagrams and tables and text.	
	<b>Project Work on an Assigned Topic using Geoinformatics as a core tool for investigation</b>	<b><i>4 Credit</i></b> <b><i>(60 marks)</i></b>
	<b>Report Submission</b>	<b><i>1 Credit</i></b> <b><i>(20 marks)</i></b>
	<b>Viva</b>	<b><i>1 Credit</i></b> <b><i>(20 marks)</i></b>

**SEMESTER 6**  
**Paper GIM-VC-6036**  
**INTERNSHIP TRAINING - 2**  
**Total Marks: 100**  
**6 Credits**

<b>Objective:</b>	This paper is aimed at providing the students with an opportunity to work in a professional environment and develop skills related to the relevant course components. Internships are done in a Government, research and implementation institution and / or a Private, Corporate institution of repute with specialization on the technologies of cartography, remote sensing, GIS and GPS, including Computer work in a prestigious lab.	
	<b>Internship on Any One of the Following Topics</b> <b>a. Land Management</b> <b>b. Water Resource Management</b> <b>c. Agriculture &amp; Soil Management</b>	<b>4 Credit</b> <b>(60 marks)</b>
	<b>Report Submission</b>	<b>1 Credit</b> <b>(20 marks)</b>
	<b>Viva</b>	<b>1 Credit</b> <b>(20 marks)</b>