North Maharashtra University, Jalgaon

Syllabus for

S. Y. B. Sc.
Geoinformatics

(w.e.f. - June 2016)

North Maharashtra University, Jalgaon

S.Y. B. Sc.

GEOINFORMATICS

(w.e.f. - June 2016)

Second Year B. Sc. - Geoinformatics	
Semester III	
Paper Code	**Paper Name**
GEOI 231	Introduction to C++ and OOP - I
GEOI 232	Introduction to Geoscience
GEOI 233	Lab course based on GEOI 231 & GEOI 232
Semester IV	
Paper Code	**Paper Name**
GEOI 241	Introduction to C++ & OOP - II
GEOI 242	Introduction to Remote Sensing
GEOI 243	Lab course based on GEOI 241 & GEOI 242

GEOI 231: Introduction to C++ & OOP - I

Total Lectures: 60

Unit 1 - Introduction to C++ **Lectures: 12, Marks: 18**

1.1 C++: history, uses, applications, structure of C++ program

1.2 Header files

1.3 Keywords, variable, variable scope - local and global; constants - character, integer, float, string; escape sequences, data types - built-in and user defined

Unit 2 - Operators and I/O in C++ **Lectures: 12, Marks: 16**

2.1 Operators - arithmetic, relational, logical, assignment, bitwise, conditional, operator precedence and associativity.

2.2 Simple programs using cout and cin

2.3 Manipulator: definition, endl, setw and setfill

Unit 3 - Control Structures and Looping **Lectures: 16, Marks: 28**

3.1 Decision making constructs - If, If-Else, Nested If-Else and Switch

3.2 Looping constructs - While, For, do-while and nested looping

3.3 Infinite loop, loop control statements - break, continue, go to and Exit statements

Unit 4 - Array and Function **Lectures: 20, Marks: 28**

4.1 Array - definition, advantages, array declaration, initialisation, accessing element of array

4.2 Two dimensional array - declaration, initialisation, accessing element of two dimensional array, character array, pointer

4.3 Function, advantages of function, defining function - return type, function name and parameters; declaring function, function arguments - pass by value and pass by reference, function recursion

Recommended Books:

- John R. Hubbard, Programming with C++, 2nd Edition, Tata McGraw – Hill Education
- Davidson & Cohoon, C++ Program Design: An Introduction to Programming and Object-Oriented Design, McGraw-Hill (2002)
- Robert Lafore, Object Oriented Programming in-C++, 4th Edition, Pearson India
- K.R. Venugopal, Mastering C++, 2nd Edition, McGraw Hill Education (2013)
- Bjarne Stroustrup, The C++ Programming Language, 3rd Edition, Pearson India
- D Ravichandran, Programming with C++, 2nd Edition, Tata McGraw - Hill Education
- M. P. Bhave, Object-Oriented Programming With C++, Pearson Education India (2004)

GEOI 232: Introduction to Geoscience

Total Lectures: 60

Unit 1 - Introduction to Rocks **Lectures: 12, Marks: 14**

1.1 Rock: definition, types, characteristics and rock cycle

1.2 Introduction to the rock forming minerals

1.3 Introduction to geologic structures: folds, faults, unconformities and joints

Unit 2 - Introduction to Geomorphology **Lectures: 14, Marks: 22**

2.1 Geomorphology: definition, weathering processes & agents

2.2 Concept of geomorphological cycle

2.3 Landform: definition, erosional and depositional landforms formed by the action of water, wind, sea and glacier

2.4 Watershed: introduction, importance of watershed, drainage pattern and its types, concept of watershed management

Unit 3 - Introduction to Soil **Lectures: 16, Marks: 26**

3.1 Soil: definition, soil profile, soil survey methods, on the basis of purpose: special purpose & general purpose, on the basis of scale: exploratory, reconnaissance and detailed survey, soil classification

3.2 Soil formation process

3.3 Soil erosion and sedimentation, saline and alkaline soils, their measures of reclamation, soil conservation and its strategies

3.4 Land degradation: introduction, causes and effects

Unit 4 - Introduction to Hydro-geology **Lectures: 18, Marks: 28**

4.1 Hydrologic cycle

4.2 Groundwater: Introduction, importance and vertical distribution of groundwater

4.3 Aquifer: definition, types of aquifer: unconfined, confined and perched

4.4 Hydraulic properties of rocks: porosity, permeability, specific yield and specific retention

4.5 Groundwater problems: contamination, overuse & depletion; groundwater management using artificial recharge methods

Recommended Books:

- Kulkarni et al, Concepts in Geology, Scientifica publication (2013)
- Alan H. Strahler, Introducing Physical Geography, 6th Edition, Wiley (2013)
- Savindra Singh, Geomorphology: Prayag Pustak Bhawan (1998)
- David Keith Todd, Groundwater Hydrology, 2nd Edition, Wiley India
- John Gerrard, Fundamentals of Soils, Psychology Press (2000)
- C.E. Millar, Fundamentals of Soil Science, Daya Books (2011)
- Das Madan Mohanetal, Watershed Management, PHI (2012)

GEOI 233: Lab course based on GEOI 231 & GEOI 232

Practicals Based on GEOI 231 -

01. Introduction Borland/Turbo C++ environment & basic C++ program syntax.
02. Write a C++ program to demonstrate the use of variables and various operators.
03. Write a C++ program to demonstrate the use of decision making constructs.
04. Write a C++ program to demonstrate the use of loop constructs.
05. Write a C++ program to demonstrate the use of array and string manipulations.
06. Write a C++ program to demonstrate the use of function.

Practicals Based on GEOI 232 -

01. Physical characteristics of minerals
02. Interpretation of rocks and landforms
03. Study of relief features by contours, profiles-longitudinal profile, transverse profile, intervisibility
04. Interpretation of geological maps
05. Watershed delineation & morphometric analysis using AutoCAD
06. Map showing different types of soils in India

Note: **Each practical will be of 04 periods**

Recommended Books:

- John R. Hubbard, Programming with C++, 2nd Edition, Tata McGraw – Hill Education (2000)
- K.R. Venugopal, Mastering C++, 2nd Edition, McGraw Hill Education (2013)
- Bjarne Stroustrup, The C++ Programming Language, 3rd Edition, Pearson India
- D Ravichandran, Programming with C++, 2nd Edition, Tata McGraw - Hill Education
- Dougal Dixon, The Practical Geologist, Simon and Schuster (1992)
- Savindra Singh, Geomorphology: Prayag Pustak Bhawan (1998)
- Md. Zulfequar Ahmad Khan, Text Book of Practical Geography, Concept Publishing Company (1988)
- Tarak Das Biswas, Textbook of Soil Sciences, Tata McGraw-Hill Education (2001)

GEOI 241: Introduction to C++ & OOP - II

Total Lectures: 60

Unit 1 - Introduction to OOP **Lectures: 16, Marks: 26**

1.1 Concept of procedure oriented programming, concept of object oriented programming, features of OOP, advantages of OOP, object based & object oriented languages

1.2 Characteristics of OOP - object, class, data abstraction, data encapsulation, polymorphism, and inheritance

Unit 2 - Class and Object **Lectures: 16, Marks: 26**

2.1 Defining a class, defining members(data and functions) of class, class access modifiers (public, private and protected), declaring objects, accessing data members of class, accessing member functions of class

2.2 Constructor, constructor types - default, parameterized and copy constructor; constructor overloading, destructor

2.3 Concept of operators overloading, overloading unary and binary operators

Unit 3 - Inheritance and Polymorphism **Lectures: 16, Marks: 26**

3.1 Benefits of inheritance, basic syntax of inheritance, inheritance visibility mode

3.2 Various types of inheritance (single, multiple, hierarchical, multilevel and hybrid)

3.3 Types of polymorphism - static and dynamic, concept of function overloading, function overloading by changing number of arguments & by having different types of argument

3.4 Virtual function, pure virtual function, abstract class, virtual destructor

Unit 4 - Exception Handling and File **Lectures: 12, Marks: 12**

4.1 Exception, handling exception in C++: Throw, Try, Catch

4.2 Stream, C++ stream classes, unformatted I/O operation, formatted I/O operation

4.3 File: introduction, file stream classes, opening & closing file, writing to file, reading from file, file position pointers

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- John R. Hubbard, Programming with C++, 2nd Edition, Tata McGraw – Hill Education
- Davidson & Cohoon, C++ Program Design: An Introduction to Programming and Object-Oriented Design, McGraw-Hill (2002)
- Robert Lafore, Object Oriented Programming in-C++, 4th Edition, Pearson India
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- D Ravichandran, Programming with C++, 2nd Edition, Tata McGraw - Hill Education
- M. P. Bhave, Object-Oriented Programming With C++, Pearson Education India (2004)

GEOI 242: Introduction to Remote Sensing

Total Lectures: 60

Unit 1 - EMR **Lectures: 20, Marks: 30**

1.1 Methods of remote sensing - active and passive; working principle of remote sensing system, advantages and limitations of remote sensing system

1.2 Electro-magnetic radiation, electro-magnetic spectrum, energy interaction with atmosphere, concept of atmospheric window

1.3 Spectral signatures, Spectral reflectance curve, interaction of EMR with earth's surface materials - water, vegetation, soil and snow

Unit 2 - Remote Sensing Sensor and Platform **Lectures: 12, Marks: 18**

2.1 Sensor: introduction, sensor resolution- spectral, spatial, radiometric and temporal

2.2 Examples of sensor: MSS, TM, ETM, PAN, LISS III and LISS IV

2.3 Remote sensing platform: introduction, types - ground borne, air borne and space borne

Unit 3 - Basics of Satellite **Lectures: 12, Marks: 24**

3.1 Satellite: definition, types - earth observation, meteorological, communication and navigation, orbits: sun-synchronous and geo-synchronous

3.2 Medium resolution remote sensing satellites: IRS-P6 and Landsat 8

3.3 High resolution remote sensing satellites: SPOT 7, IKONOS, QuickBird, GeoEye-1 and WorldView-3

Unit 4 - Image Interpretation **Lectures: 16, Marks: 18**

4.1 Satellite image visualization: gray scale image, true and false color composites

4.2 Image interpretation: Introduction, visual and digital interpretation methods, elements of image interpretation: tone, texture, pattern, shape, size, shadow and association

Recommended Books:

- M. Anji Reddy, Textbook of Remote Sensing and Geographical Information Systems, 3rd Edition, BS publication
- Lillesand and Kiefer, Remote Sensing and Image Interpretation, John Wiley and Sons, New York (1976)
- George Joseph, Fundamentals of Remote Sensing, University Press Pvt. Ltd. Hyderabad (2004)
- Campbell J. B., Introduction to Remote Sensing, 5th edition, Taylor & Francis, London (2002)
- Shiv. N. Pandey, Principles and Applications of Photogeology, New Age International (1987)
- http://earthobservatory.nasa.gov/Features/RemoteSensing/remote.php

GEOI 243: Lab course based on GEOI 241 & GEOI 242

Practicals Based on GEOI 241 -

01. Write a C++ program to demonstrate the concept of class, object, constructor & destructor
02. Write a C++ program to demonstrate use of unary and binary operator overloading
03. Write a C++ program to demonstrate use of various types of inheritance
04. Write a C++ program to demonstrate use of function overloading
05. Write a C++ program to demonstrate use of static and dynamic polymorphism
06. Write a C++ program to demonstrate various operations on file

Practicals Based on GEOI 242 -

01. Introduction to satellite image
02. Study of spectral reflectance curve
03. Visual interpretation of satellite image
04. Identification & mapping of drainage pattern using satellite image
05. Identification & mapping of Land use & Land cover using satellite image
06. Identification & mapping of geomorphic features/landforms using satellite image

Note: **Each practical will be of 04 periods**

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- Davidson & Cohoon, C++ Program Design: An Introduction to Programming and Object-Oriented Design, McGraw-Hill (2002)
- Robert Lafore, Object Oriented Programming in-C++, 4th Edition, Pearson India
- K.R. Venugopal, Mastering C++, 2nd Edition, McGraw Hill Education, (2013)
- Thomas Lillesand, Remote Sensing and Image Interpretation, 7th Edition, Wiley India
- B C Panda, Remote Sensing: Principles and Applications, 1st Edition, Viva Books Pvt Ltd

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S.Y. B.Sc. Geoinformatics Syllabus
Semester III and IV Equivalence
(With Effect from June 2016)

New Course	Old Course
GEOI 231 Introduction to C++ and OOP - I	GEOI 211 Introduction to Geo-Sciences I
GEOI 232 Introduction to Geoscience	GEOI 212 Geomorphology and Tectonics
GEOI 241 Introduction to C++ & OOP - II	GEOI 221 Introduction to Geo-Sciences II
GEOI 242 Introduction to Remote Sensing	GEOI 222 Basic Concepts In Remote Sensing
GEOI 233 Lab course based on GEOI 231 & GEOI 232 GEOI 243 Lab course based on GEOI 241 & GEOI 242	GEOI 203 Practical Course