VIDYASAGAR UNIVERSITY

Midnapore, West Bengal

PROPOSED CURRICULUM & SYLLABUS (DRAFT) OF

BACHELOR OF SCIENCE (HONOURS)

MAJOR IN GEOGRAPHY

4-YEAR UNDERGRADUATE PROGRAMME

(w.e.f. Academic Year 2023-2024)

Based on

Curriculum & Credit Framework for Undergraduate Programmes

(CCFUP), 2023 & NEP, 2020

VIDYASAGAR UNIVERSITY
BACHELOR OF SCIENCE (HONOURS) MAJOR IN GEOGRAPHY
(under CCFUP, 2023)

Level	YR.	SEM	Course Type	Course Code	Course Title	Credit	L-T-P	Marks		
								CA	ESE	TOTAL
B.Sc. (Hons.)	2nd	III	SEMESTER-III							
			Major-3	GEOHMJ03	T: Human Geography; P: Practical	4	3-0-1	15	60	75
			Major-4	GEOHMJ04	P: Statistical methods	4	0-0-4	15	60	75
			SEC	GEOSEC03	P: Computer Programming (R/Python) (Practical)	3	0-0-3	10	40	50
			AEC	AEC03	Communicative English -2 (***common for all programmes***)	2	2-0-0	10	40	50
			MDC	MDC03	Multidisciplinary Course -3 (***to be chosen from the list***)	3	3-0-0	10	40	50
			Minor-3 (Disc.-I)	GEOMIN03	T: Contemporary Environmental Issues;	4	3-1-0	15	60	75
					Semester-III Total	20				375
		IV	SEMESTER-IV							
			Major-5	GEOHMJ05	T: Climatology; P: Weather map (Practical)	4	3-0-1	15	60	75
			Major-6	GEOHMJ06	P: Cartograms and thematic mapping (Practical)	4	0-0-4	15	60	75
			Major-7	GEOHMJ07	T: Geography of India and West Bengal; P: Topographical Map (Practical)	4	3-0-1	15	60	75
			AEC	AEC04	MIL-2 (***common for all programmes***)	2	2-0-0	10	40	50
			Minor-4 (Disc.-II)	GEOMIN04	P: Techniques in Geography (Practical)	4	0-0-4	15	60	75
			Summer Intern.	INT	Internship/ Apprenticeship - activities to be decided by the Colleges following the guidelines to be given later	4	0-0-4	-	-	50
					Semester-IV Total	22				400
					TOTAL of YEAR-2	42				775

MJ = Major, MI = Minor Course, SEC = Skill Enhancement Course, AEC = Ability Enhancement Course, MDC = Multidisciplinary Course, CA= Continuous Assessment, ESE= End Semester Examination, T = Theory, P= Practical, L-T-P = Lecture-Tutorial-Practical, MIL = Modern Indian Language

Programme Specific Objectives

Geography has been broadly accepted as a bridge discipline between human and physical sciences. In the beginning, geography focussed on the physical aspects of the earth but modern geography is an all-encompassing discipline that seeks to understand the earth and all of its human and natural processes as integrating elements. Geography has emerged through time as a trans-disciplinary subject integrating regional diversity with the concepts of the timing of space and the spacing of time. It provides broad, human and place-centered perspectives on the transformation of rural ecology to globalized urban landscape at different levels, from the local/regional/national to global. Geography is transformed through:

- Journey from Village Ecology to Urban Regional Studies
- Qualitative Techniques to Spatial Information Technology
- Global to Micro-level Community Perception Approach

It is essential to focus on the current socio-spatial problems, issues and challenges to make the students aware of the application of geography to sort out the societal upcoming problems. It is also essential to rejuvenate the ancestral geographical knowledge to address the current local and global problems. In the light of exponential changes in the field of arts, science and technology, it is to be studied from multifaceted angles. It is important for the policy makers to consider the geo-spatial aspects with references to the location and in context of the best utilization of public utilities. It is further expected that if the above said spatial aspects are considered, it will certainly develop the lagging regions and people living therein.

Graduate Attributes in Geography The curriculum uses CBCS framework and organizes under Core Course, Skill Enhancement Course, Elective - Discipline Specific and Elective - Generic Courses. The core courses cover key areas of geography about which all students should have basic knowledge. These courses are grouped as follows:

A. Theory – These courses build up the theoretical and conceptual foundations of geography.

B. Practical – Three courses on Statistical Techniques in Spatial Analysis; Remote Sensing and Geographical Information System, GIScience and Research Methods and Fieldwork in Geography will strengthen the methodological and practical foundations of geography.

C. Regional Approach – Such courses focus on World Geography, Geography of India / West Bengal.

D. Application Oriented – This includes disaster management, climate change, tourism geography, health and wellbeing, etc.

Each Course has objective, learning outcomes, five uniform contents and reference books lists also attached with each course.

SEMESTER-III

MAJOR (MJ)

MJ-3: Human Geography (Theory) **Credits 04 (Full Marks: 75)**

Course Objective

1. The content of human Geography and cultural landscape at different levels.
2. Patterns and processes human adaptation to environment
3. Human landscapes and cultural diversity of the world.

Course Learning Outcomes

Relationship between physical environment and human societal development will be explored

1. 1.Students will be able to evaluate the growth patterns of different human societies
2. 2.Students will be able to relate the relation between Climate and Society.
3. 3.This topic will help them to understand how societies understand and respond to climate change.

MJ-3T: Human Geography (Theory) **Credits 03**

Course contents:

1. Nature , scope and recent trends. Elements of Human Geography
2. Modes of societies: Hunting and food gathering; Pastoral nomadism; Subsistence farming; Industrial and urban societies
3. Human adaptation to environment: Eskimo, Masai, Jarwa, Gaddi, Santhals
4. Cultural regions of the world: language and religion; Indian scenario
5. Climate change and human societies

Suggested Readings:

1. Bergman, E.F (1995): Human Geography-Culture, Connections and Landscape, Prentice Hall, New Jersey
2. Chisholm. (1975): Human Geography, Penguin Books, Hermondsworth.
3. Johnston R; Gregory D, Pratt G. et al. (2008) The Dictionary of Human Geography, Blackwell Publication.
4. Jordan-Bychkov et al. (2006) The Human Mosaic: A Thematic Introduction to Cultural Geography. W. H. Freeman and Company, New York.
5. Norton. W. (2001): Human Geography, 4th Edition Oxford University press, Oxford
6. Raw, M. (1986): Understanding Human Geography: A Practical Approach, Bell and Hyman. London
7. Rubenstein, J.M. (2002), The Cultural Landscape, 7th edition, Prentice Hall, Englewood Cliffs
8. Smith D M (1982): Human Geography: A Welfare Approach, Edward Arnold, London

MJ-3P: Human Geography (Practical) **Credits 01**

Course objectives

The meaning of the term 'development' and Human Development has been refashioned multiple times post World War II. Initially, development was conceived as merely the economic growth of the country. The belief was that the fruits of economic growth would trickle down to the poorest of the poor. Development theory moved away from traditional ideas of gathering wealth towards a more subjective understanding of development. This unit discusses the concepts of Human Development and various Human Development Indices which are important for assessing Human development resources of a nation.

Course outcome:

After completing the course the students will be able to to understand

1. Human Equity, Empowerment, Sustainability and Productivity of human development.
2. Methods to represent human data through various indices and cartograms and thematic maps

Course Outcome:

1. Different approaches to measure Human Development: Income approach, welfare approach, Basic needs approach and capabilities approach.
2. Methods of studying human development: Human Development Index and Gender Development Index, Components of HDI and GDI, , Methods to measure Poverty Index (Pv1 and Pv2),Measuring methods
3. Concept of GEM and methods to measure GEM, Gender Equality and Inequality Indices,Women's Economic Opportunity Index (WEOI), Gender Gap Measure (GGM) index.

Suggested Readings:

1. Papalia, D.E. , Olds, S.W. and Feldman, R.D. (2006). Human development.9th Ed. New Delhi: Tata McGraw- Hill.
2. Journal of Human Development and Capabilities,Published by Taylor & Francis (Routledge),Print ISSN: 1945-2829
3. Klasen, Stephan(2017): Working Paper UNDP's gender-related measures: Current problems and proposals for fixing them
4. Economist Intelligence Unit, 2012, Women's Economic Opportunity Index 2012, EIU, August 23. Web Link:

MJ-4: Statistical methods **Credits 04 (Full Marks: 75)**

MJ-4P: Statistical methods (Practical) **Credits 04**

Course Objective

This course is designed to introduce students to the fundamentals of statistics. Spread with five sub-modules, this course is for the beginners to get an acquaintance with basic statistical methods. The objectives of this course are-

1. To build fundamental knowledge of statistical analysis.
2. To get an adequate understanding of distribution of data and its implications to further bivariate analysis.

Course Learning Outcomes

Upon completion of this course, the students will be able to -

1. Learn the basic concepts of variables, vectors, random sampling process.
2. Learn the distribution of data and its applications.
3. Gain a working knowledge of describing statistical data.

Course contents:

1. Fundamental concepts: variable, vector, concepts of population and sample, random sampling; data type in statistics: nominal, ordinal, interval, and ratio scale data, types of sampling.
2. Frequency distribution and its implication, construction of cumulative frequency distribution curves; extraction of samples from a data matrix in excel using random, systematic and stratified method of sampling.
3. the shape of the distribution of data - skewness and kurtosis; normal distribution- properties of normal distribution. Examples of normal distribution; Representation of data distribution through boxplot. Data standardization in statistics.
4. Measures of central tendency and dispersion: mean, mode, median, standard deviation.
5. Measures of association: Pearson's correlation and Spearman's rank correlation.

Suggested Readings:

1. Berry B J L., and Marbel D F. (eds). Spatial analysis - a reader in Geography.
2. Ebdon D., 1977. Statistical Geography: A practical approach.
3. Hammond P and McCullagh P S., 1978. Quantitative techniques in Geography: an introduction. Oxford Univerity Press.
4. King L S., 1969. Statistical Analysis in Geography,Printice Hall.
5. Mahmood, A. 1977. Statistical Method in Geographical Studies, Concept Publishing.
6. Pal, S K. 1998. Statistics for Geoscientists, Tata McGraw Hill, New Delhi.
7. Sarkar, A., 2013. Quantitative Geography. Techniques and Presentations. Orient Black Swan Private Ltd., New Delhi.
8. Silk J. 1979. Statistical Conepts in Geography, Allen and Unwin, London.
9. Spiegel M R. Statistics, Schaum's Outline Series.
10. Yeats M., 1974. An introduction to Quantitative Analysis in Human Geography, McGraw Hill, New York.

MINOR (MI)

MI – 3: Contemporary Environmental Issues Credits 04 (Full Marks: 75)

Course Objective:

This course is designed to sketch an overall idea of contemporary environmental issues which are also attached to some of the key social issues. It includes the topics of climate change, pollution, human health, migration and gender-climate nexus. The objectives of the course are -

1. To build an overview of the environmental issues, especially focusing on the climate change related issues.
2. To unreveal the nexus between climate change and gender and migration

Course Learning Outcomes

Upon completion of this course, the students will be able to learn -

1. Some basic idea of climate change science and climate change related adaptation policies.
2. Some fundamentals of environmental pollution and its effect on human health.
3. The basics of climate change driven crises: miration and gender issues

MI – 3T: Contemporary Environmental Issues Credits 04

Course contents:

1. Climate change: basic science and global scenario of climate change.
2. Climate change mitigation and adaptation policy
3. Pollution and environmental degradation, effect on human health with reference to air, water, soil and plastic.
4. Environmental refugee: migration-climate nexus.
5. Gender and climate change

Suggested Readings:

1. IISD, UNITAR & UNEP (2009). IEA Training Material: Vulnerability and Climate Change Impact Assessment for Adaptation. (link)
2. IPCC (2013). Climate Change 2013. The Physical Science Basis - Summary for Policymakers.
3. OECD (2009): Guidance on Integrating Climate Change Adaptation into Development Co-operation. (link)
4. UNEP (2009). Climate Change Science Compendium. (link)
5. UNEP (2009). Climate in Peril, a Popular Guide to the Latest IPCC Report. (link)
6. UNEP & UNDP (2011). Mainstreaming Climate Change Adaptation into Development Planning: A Guide for Practitioners. (link)
7. Global Gender and Climate Alliance (2016). Gender and climate change: A closer look at the existing evidence. (link)
8. UN Women watch (2009). Women, gender equality and climate change. (link)
9. Myers, N (2001). Environmental refugees; a growing problem of 21st century. (link)
10. UNCHR, (2022). Climate Change, Displacement and Human Rights. (link)
11. Brookings. (2019). The climate crisis, migration and refugees. (link)
12. VK Ahlualia. (2014). Environmental Pollution and Health. TERI Press, New Delhi, ISBN:9788179934616.
13. Frank R. Spellman. (2021). The science of environmental pollution. ISBN 9781032016832. CRC Press. Boca Raton

SKILL ENHANCEMENT COURSE (SEC)

SEC 3: Computer Programming (R/Python) **Credits 03**

SEC3P: Computer Programming (R/Python) - Practical **Full Marks: 50**

Course Objective

This course provides an introduction to computer programming using the R or Python languages (whichever feasible based on the infrastructure). The course is designed to escalate the skill sets of the students to bridge the gap towards their future academic endeavors in Geospatial Science or any related application areas in the Earth, Atmosphere and Planetary Sciences as well as in the areas of Human and Population Geography and Developmental Studies. The objectives of the course are -

1. To enhance the analytical skills using the first programming language.
2. To take the leverage of the analytical platforms to analyze and comprehend the geographic data.
3. To prepare the students for doing better research

Course Learning Outcomes

Upon completion of this course, students will be able to -

1. Learn the basics of computer programming using R/Python
2. Learn the data structures that these two platforms can deal with, writing functions, data filtering and summary methods
3. Learn how to build graphics and regression models using R and Python.

Course Outline:

1. Basics of computer programming: understanding the interface of programming languages such as R and Python
2. Data structure in R/Python: array, vector, matrix, data frame, importing data in R/Python.
3. Functions in R/Python: the basic syntax of statistical functions, writing and using functions in R/Python
4. Data filtering and summary methods in R/Python: conditional functions, loop functions such as for and while loop for iterative calculation. Executing statistical tests in R/Python.
5. Building graphics in R/Python: creating histogram, scatterplot, boxplot, line plot; building a regression model, visualisation data using R/Python.

For examination:

a. 30 marks Assignment
b. 10 viva-voce

During viva voce, examiners will examine their level of application and depth of understanding on the above issue.

Suggested Readings:

1. Tilman M. Davies. 2016. The book of R: A first course in programming and statistics. No Starch Press, US.
2. Andy Field, Jeremy Miles, and Zoe Field. 2022. Discovering statistics using R. SAGE Publications India Pvt Ltd. India.
3. Jared P. Lander. 2018. R for everyone: Advanced analytics and graphics. 2nd Edition. Pearson Education. India.
4. Bharti Motwani. 2019. Data analytics with R. Wiley. India.
5. Sandip Rakshit. 2017. R programming for beginners. McGraw Hill Education. India.
6. Eric Matthes. 2016. Python crash course. No Starch Press, US.
7. Paul Barry. 2016. Head-first Python, 2nd Edition. O'Reilly.
8. William McKinney. 2017. Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython, O'Reilly Media.
9. David Landup. 2021. Data Visualization in Python with Pandas and Matplotlib. Stack Abuse.
10. Log2Base2 courses on python (https://log2base2.com/courses/python).
11. Coursera. Data Analysis with Python (https://www.coursera.org/learn/data-analysis-with-python)
12. Free codecamp. Data analysis with python (https://www.freecodecamp.org/learn/data-analysis-with-python/)
13. Coursera. Data analysis with R-programming (https://www.coursera.org/learn/data-analysis-r?).

SEMESTER-IV

MAJOR (MJ)

MJ-5: Climatology **Credits 04 (Full Marks: 75)**

Course Objective

This course is designed to introduce students to some of the key concepts of climatology. The five sub-modules carefully drafted to build a comprehensive knowledge base of global to mesoscale climate and weather phenomena. The objectives of the course are -

- To build a fundamental knowledge of weather and climate systems.
- To understand the physical principles of mesoscale weather phenomena.

Course Learning Outcomes

Upon completion of this course, students will be able to-

- Learn the principles of genesis of high and low pressure systems and forces that controls the wind movement.
- Learn the thermal balance of the global atmosphere.
- Learn the mesoscale weather phenomena.
- Learn the basics of climate classification schemes.
- Learn hands-on working knowledge of weather map related parameters.

MJ-5T: Climatology (Theory) **Credits 03**

Course contents:

1. Structure and composition of the atmosphere
2. Weather and climate parameters; surface solar radiation, RH, precipitation, wind, temperature, dew point temperature; vertical and horizontal distribution of temperature.
3. Heat balance; atmospheric pressure; the genesis of high and low-pressure cells; thermal inversion: causes and consequences; greenhouse effect and importance of ozone layer.
4. Formation of clouds and mechanism of precipitation; air mass types and characteristics; atmospheric instability: barotropic and baroclinic instability; general circulation model; jet streams and easterlies; monsoon mechanism; genesis and development of tropical and frontal cyclones.
5. Climate classification after Koppen, Thornthwaite and Oliver: basis and classification scheme.

MJ-5P: Weather map (Practical) **Credit 01**

1. Symbols, used to denote weather phenomena, station model
2. Use of weather instruments (hygrometer, barometer)
3. Making of climograph and hythergraph, Preparation of isohytes and isobars, Cross profile of isobars, derivation of pressure gradients based on the cross profile.
4. Interpretation of weather maps issued by IMD.

Suggested Readings:

1. Barry R G. and Carleton A M. 2001. Synoptic and Dynamic Climatology, Routledge, UK.
2. Barry R G. and Chorley R J. 1998. Atmosphere, weather and climate, Routledg, New York.
3. Critchfield H J. 1987. General Climatology, Prentice Hall of India, New Delhi.
4. Lutgens F K, Tarbuck E J., and Tasa D., 2009. The Atmosphere: an introduction to meteorology, Printice Hall, Englewood Cliffs, New Jersey.
5. Oliver J E., and Hidore J J., 2002. Climatology: An atmospheric science, Pearson Education, New Delhi.
6. Trewartha G T., and Horne L H., 1980. An introduction to climate, McGraw Hill.
7. Vasquez T., 2003. Weather map handbook. Weather Graphics Technologies, USA.
8. Collins, Richard L., 1985. Flying the weather map. Collier Macmillan
9. Saha P, Basu P. 2010. Advanced Practical Geography. Bookd and Allied Pvt. Ltd. Kolkata
10. Chaston, Peter R. 2002. Weather Maps: How to Read & Interpret All the Basic Weather Charts. Chaston Scientific Inc.

MJ-6: Cartograms and thematic mapping — Credits 04 (Full Marks: 75)

Course Objective

This course is designed to introduce students to the fundamentals of representing the data. With several geometric shapes, scaled by their magnitude, the content of the course tries to cover some basic data representation methods, including thematic mapping. The objectives of the course are -

- To gain a working knowledge of the meaningful data representation techniques.

Course Learning Outcomes

Upon completion of this course, students will be able to -

- Learn building 1D/2D modes of data representation.
- Learn the thematic map making skill which has immense importance in academia as well as in other fields of public services.

MJ-6P: Cartograms and thematic mapping (Practical) — Credits 04

Course contents:

1. Concepts of 1D/2D cartograms; line, bar, histograms
2. Cartograms: Proportional Circle, Square, Dots and spheres, and Pie graph
3. Age-Sex Pyramid, Dependency Ratio
4. Population Maps and Diagrams: Population Density by Choropleth, Distribution by Dot and Sphere.
5. Thematic mapping of Data – Symbols, Dots, Choropleth, Isopleth and Flow Diagrams, and their interpretation. Include data from both physical and human geography.

Suggested Readings:

1. Monkhouse F. J. and Wilkinson H. R., 1973: Maps and Diagrams, Methuen, London.
2. Rhind D. W. and Taylor D. R. F., (eds.), 1989: Cartography: Past, Present, and Future, Elsevier, International Cartographic Association.
3. Robinson A. H., 2009: Elements of Cartography, John Wiley and Sons, New York

MJ-7: Geography of India and West Bengal — Credits 04 (Full Marks: 75)

Course Objective

1. Various dimensions of the geographical features of India and their spatial distribution.
2. Detailed analysis of economic resources of India
3. Understanding of regional divisions of India and West Bengal

Course Learning Outcomes

After the completion of course, the students will have ability to:

1. Understand the physical profile of the country and State
2. Study the resource endowment and its spatial distribution and utilization for sustainable development
3. Synthesise and develop the idea of regional dimensions.

MJ-7T: Geography of India and West Bengal (Theory) — Credits 03

Course contents:

Tectonic and physiographic divisions of India. Climate, soil and vegetation: Characteristics and classification

1. Population: Distribution, growth, structure, and policy. Distribution of population by race, caste, religion, language, tribes
2. Agriculture, mineral (iron ore) and power resources (coal, petroleum and natural gas) of India. Industrial development: Automobile and information technology, chemical hubs.
3. Physiographic divisions, forest, water, mineral, agriculture and industrial resources of West Bengal
4. Population: Growth, distribution and human development of West Bengal. Regional Problem: Darjeeling Hills, Jangalmahal and Sundarban

MJ-7P: Topographical Map (Practical) — Credit 01

1. Topographical map: Numbering system, Broad Physiographic Division, Serial Profile: Superimposed, Projected, Composite.
2. Extraction of cultural features from toposheet; Relation between physical & cultural features: Transect Chart.
3. Annual Trend of Production of Mineral Resources by time series analysis.

Suggested Readings:

1. Hussain M. (2020) Geography of India. Mc Graw Hill
2. Khullar D.R. (2018) India- A comprehensive Geography. Kalyani publisher
3. Deshpande C. D., 1992: India: A Regional Interpretation, ICSSR, New Delhi.
4. Johnson, B. L. C., ed. 2001. Geographical Dictionary of India. Vision Books, New Delhi.
5. Mandal R. B. (ed.), 1990: Patterns of Regional Geography – An Intenational Perspective. Vol. 3 – Indian Perspective.
6. Sdyasuk Galina and P Sengupta (1967): Economic Regionalisation of India, Census of India
7. Sharma, T. C. 2003: India - Economic and Commercial Geography. Vikas Publ., New Delhi.
8. Singh R. L., 1971: India: A Regional Geography, National Geographical Society of India.
9. Singh, Jagdish 2003: India - A Comprehensive & Systematic Geography, Gyanodaya Prakashan, Gorakhpur.
10. Spate O. H. K. and Learmonth A. T. A., 1967: India and Pakistan: A General and Regional Geography, Methuen.
11. Tirtha, Ranjit 2002: Geography of India, Rawat Publs., Jaipur & New Delhi.
12. Pathak, C. R. 2003: Spatial Structure and Processes of Development in India. Regional Science Assoc., Kolkata.
13. Tiwari, R.C. (2007) Geography of India. Prayag Pustak Bhawan, Allahabad
14. Sharma, T.C. (2013) Economic Geography of India. Rawat Publication, Jaipur

MINOR (MI)

MI-4: Techniques in Geography **Credits 04 (Full Marks: 75)**

Course Objective

This course is designed for the students of interdisciplinary studies. The course is designed to get an overview of the basic analytical techniques in geography. It begins with the concept of scale and gradually delve into the modern methods of geospatial analysis using geospatial softwares. The prime objectives of this course are -

1. Develop a comprehensive knowledge of the basic analytical tools of geography.
2. To give an exposure to the Geospatial Analytical tools for analyzing the geographic phenomena.

Course Learning Outcomes

Upon completion of this course, the students will be able to learn -

1. The details of map, scale and some basic idea of surveying techniques.
2. A preliminary working idea of map projection systems.
3. A hands-on experience of GIS environment using software

MI-4P: Human Geography (Practical) **Credits 04**

Course contents:

1. Concepts of scale: linear scale, comparative scale, diagonal scale, vernier scale
2. Topographical map: system of topo map, content and significance of topo map
3. Surveying techniques: dumpy level and theodolite survey basics.
4. Map projection: fundamentals of map projection, developable surface, classification of projection, cylindrical equal area projection, simple conical projection with one standard parallel, polar zenithal projection.
5. Geospatial technology: basics of remote sensing and GIS, sensor resolutions, concept of digital image and image pixel, image interpretation keys, image correction and false color composite, concept of image classification, georeferencing, data models in GIS environment.

Suggested Readings:

1. Sarkar, A. (2015) Practical Geography: A systematic approach. Orient Black Swan Private Ltd., New Delhi
2. Saha P, Basu P. 2010. Advanced Practical Geography. Bookd and Allied Pvt. Ltd. Kolkata
3. John R Jenson. 2013. Remote sensing of the environment: an earth resource perspective, Pearson Education India.
4. George Joseph and C Jeganathan. 2018. Fundamentals of remote sensing (3rd edition), The Orient Blackswan, India.
5. Lillesand, Kiefer, Chipman. 2011. Remote Sensing and Image Interpretation, 6ed (WSE), Wiley, India.
6. John R. Jensen. 2017. Introductory Digital Image Processing: A Remote Sensing Perspective. Pearson Education, India.
7. Change K. 2019. Introduction to Geographic Information Syatem, 9th Edition, McGrawHill Education, US.
8. Kurt Menke. 2022. Discover QGIS 3.x - Second Edition (https://locatepress.com/book/dq32).
9. Scott Madry. 2021. Introduction to QGIS (https://locatepress.com/book/itq) .

10. Kurt Menke, GISP et al. 2016. Mastering QGIS - Second Edition (https://www.packtpub.com/big-data-and-business-intelligence/mastering-qgis-second-edition)
11. Anita Graser and Gretchen N. Peterson. 2016. QGIS Map Design (http://locatepress.com/qmd)
12. Anita Graser. 2016. Learning QGIS - Third Edition (https://www.packtpub.com/big-data-and-business-intelligence/learning-qgis-third-edition)
13. Alexander Bruy, Daria Svidzinsk. 2015. QGIS By Example (https://www.packtpub.com/application-development/qgis-example)
14. Rüdiger Thiede, Tim Sutton, Horst Düster, and Marcelle Sutton. 2013. The QGIS Training Manual - A Comprehensive Introduction to Quantum GIS (http://locatepress.com/qtm)