

<b>Updated Scheme of Studies BS Geography</b> <b>(With effect from Fall 2024-25)</b>			
<b>SEMESTER 1</b>			
<b>Sr. No</b>	<b>Course Code</b>	<b>Course Title</b>	<b>Credit Hours</b>
1	GEO-301	Fundamentals of Geography (M:4)	4(4-0)
2	GEO-303	Map Reading skills (M:7)	3(2-1)
3	IRS-301	Introduction to International Relations (IDC:03)	3(3-0)
4	POL-301	Introduction to Political Science (IDC:06)	3(3-0)
5	ENG-321	Functional English (GE:03)	3(3-0)
6	ISL-321	Islamic Studies / Ethics (for Non-Muslims) (GE:05)	2(2-0)
7	THQ-I*	Teaching of Holy Quran-1	1(1-0)
<b>Total</b>			<b>18</b>
<b>SEMESTER 2</b>			
<b>Sr. No</b>	<b>Course Code</b>	<b>Course Title</b>	<b>Credit Hours</b>
1	GEO-302	Region and Regional Concepts (M:10)	3(3-0)
2	GSC-321	The Science of Global Challenges (GE:08)	3(2-1)
3	ENG-322	Expository Writing (GE:11)	3(3-0)
4	PST-321	Ideology and Constitution of Pakistan (GE:13)	2(2-0)
5	ENG-303	Introduction to literary studies (GE:15)	2(2-0)
6	CSI-321	Applications of Information and Communication Technologies (ICT:3) (GE:18)	3(2-1)
7	PST-321	Pakistan Studies (GE:20)	2(2-0)
<b>Total</b>			<b>18</b>
<b>SEMESTER 3</b>			
<b>Sr. No</b>	<b>Course Code</b>	<b>Course Title</b>	<b>Credit Hours</b>
1	GEO-401	Introduction to Geostatistics (M:13)	3(2-1)
2	GEO-403	Surveying and Levelling (M:16)	3(2-1)
3	GEO-405	Fundamentals of GIS (M:19)	3(2-1)
4	QTR-421	Quantitative Reasoning-I (GE:23)	3(3-0)
5	STA-321	Introduction to Statistical Theory (IDC:09)	3(3-0)
6	ACH-411	Applied Chemistry for Geography (IDC:12)	3(3-0)
7	THQ-II*	Teaching of The Holy Quran-II	1(1-0)
<b>Total</b>			<b>18</b>
<b>SEMESTER 4</b>			
<b>Sr. No</b>	<b>Course Code</b>	<b>Course Title</b>	<b>Credit Hours</b>
1	GEO-402	Human Geography (M:23)	4(4-0)
2	GEO-404	Global Positioning Systems (M:26)	3(2-1)
3	GEO-406	Physical Geography (M:30)	4(4-0)

4	ENT-422	Entrepreneurship (GE:25)	2(0-2)
5	CCE-421	Civic and Community Engagement (GE:27)	2(2-0)
6	QTR-422	Quantitative Reasoning-II (GE:30)	3(3-0)
<b>Total</b>			<b>18</b>
<b>SEMESTER 5</b>			
<b>Sr. No</b>	<b>Course Code</b>	<b>Course Title</b>	<b>Credit Hours</b>
1	GEO-501	Geomorphology (M:33)	3(3-0)
2	GEO-503	Climatology (M:36)	3(3-0)
3	GEO-505	Economic Geography (M:39)	3(3-0)
4	GEO-507	Geographic Thoughts and Modern Concepts (M:42)	3(3-0)
5	GEO-509	Remote Sensing (M:45)	3(2-1)
6	THQ-III*	Teaching of Holy Quran-III	1(1-0)
<b>Total</b>			<b>15</b>
<b>SEMESTER 6</b>			
<b>Sr. No</b>	<b>Course Code</b>	<b>Course Title</b>	<b>Credit Hours</b>
1	GEO-502	Research Methodology (M:48)	3(3-0)
2	GEO-504	Geographic Information Science (M:51)	3(2-1)
3	GIS-504	Spatial Data Analysis (M:54)	3(2-1)
4	GEO-508	Geography of Pakistan (M:57)	3(3-0)
5	GEO-510	Cartography (M:60)	3(2-1)
6	GEO-512	Climate Change Studies (M:63)	3(3-0)
<b>Total</b>			<b>18</b>
<b>SEMESTER 7</b>			
<b>Sr. No</b>	<b>Course Code</b>	<b>Course Title</b>	<b>Credit Hours</b>
1	GEO-601**	Digital Cartography (M:66)	3(3-0)
2	IMT-631**	Internship/ Field Research Report	3(0-3)
3	GEO-603**	Regional Study of Asia/ Europe / North America / South America/ Africa/ Australia (M:69)	3(3-0)
4	THQ-IV*	Teaching of Holy Quran-IV	1(1-0)
5	GEO-605	Soil Geography	3(3-0)
6	GEO-607	Population Geography	3(3-0)
7	GEO-609	Cultural Geography	3(3-0)
8	GEO-611	Transportation Geography	3(3-0)
9	GEO-613	Geography of Recreation & Tourism	3(3-0)
10	GEO-615	Geography of Arid Lands	3(3-0)
11	GEO-617	Geography of Settlements	3(3-0)
12	GEO-619	Urban Ecology	3(3-0)
13	GEO-621	Natural Resources Management	3(2-1)
14	GEO-623	Hydro Geography	3(3-0)

15	GEO-625	Urban Geography	3(3-0)
16	GEO-627	Environmental Geography	3(3-0)
<b>Total (M:69+06=75)</b>			<b>15</b>
<b>SEMESTER 8</b>			
<b>Sr. No</b>	<b>Course Code</b>	<b>Course Title</b>	<b>Credit Hours</b>
1	CAP-630 **	Capstone Project	3(0-3)
2	GEO-602	Land use Planning	3(3-0)
3	GEO-604	Oceanography	3(3-0)
4	GEO-606	Urban Planning	3(2-1)
5	GEO-608	Environmental Impact assessment	3(3-0)
6	GEO-610	Regional Planning & Development	3(2-1)
7	GEO-612	Advance Remote Sensing	3(2-1)
8	GEO-614	Political Geography	3(3-0)
9	GEO-616	Medical Geography	3(3-0)
10	GEO-618	Geography of Natural Hazards and Disasters	3(3-0)
11	GEO-620	Industrial Geography	3(3-0)
12	GEO-622	Spatial Data Visualization	3(2-1)
13	GEO-640	Thesis (in lieu of two elective papers one from 7th and one from 8th semester)	6(0-6)
<b>Total (M:75+12=87)</b>			<b>15</b>
<b>Total Credit Hours: 135</b>			

- **Note:** Students have to choose 2 optional courses in the seventh semester and 4 optional courses in the eighth semester.
- \*Non Credit Course
- \*\*Compulsory Course

**M= Major**

**IDC = Interdisciplinary Course**

**GE= General Education Course**

### Course Contents of BS Geography

<b>GEO-301</b>	<b>Fundamentals of Geography</b>	<b>4(4-0)</b>
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Aims, scope and relationship with other domains of Geography, Major Branches of Geography, Roots of the discipline and basic geographic concept: Location, Region, Density, Dispersion, Pattern, Spatial Interaction, Scale, Spatial Diffusion, Themes and traditions of Geography, Tools of Geography: The Universe, The Earth as a planet: Celestial positions, its shape and size, Earth-sun relationship: Rotation, revolution and related Phenomena, Spheres of the earth: Lithosphere, The layered Interior of Earth surface, Minerals and igneous rocks, Sedimentary and metamorphic Rocks, Plates of Lithosphere, Atmosphere: Composition of the atmosphere, Structure of the atmosphere, Hydrosphere: Circulation of the world oceans, Biosphere, Biogeographic Processes, Man-environment interaction: Environmental determinism, Environmental possibilism, Population: Natural increase as a component of population change, Demographic transition, Link between population and development, Major Economic activities, Settlements: Settlement dynamics, Pollution: Types of Pollution.

#### **Recommended Books**

1. Mitchell, J. T. (2022). *Geography for Dummies*. John Wiley & Sons.
2. The international encyclopedia of geography : people the earth environment and technology. (2017). . John Wiley & Sons. February 29 2024
3. Dorling, D., & Lee, C. (2016). *Geography: ideas in profile*. Profile Books.
4. Arbogast, A. F. (2017). *Discovering physical geography*. John Wiley & Sons.
5. Christopherson, R. W., & Birkeland, G. H. (2018). *Geosystems: An introduction to physical geography*.
6. Markoski B. (2018). *Foundations of geography* (original macedonian title. Springer. February 29 2024
7. Dahlman, C., & Renwick, W. H. (2015). *Introduction to geography: People, places & environment*. Boston: Pearson.
8. Dahlman, C. H., Renwick, W. H., & Bergman, E. (2015). *Introduction to Geography*. Pearson Education UK.
9. Strahler, A. (2013) *Introduction to Physical Geography*, John Wiley & Sons, New Jersey.

<b>GEO-303</b>	<b>Map Reading Skills</b>	<b>3(2-1)</b>
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Map: Uses and importance of Map, Different Classes of Map, Basic Map Skills, Map Elements, Determination of direction, Unit: Unit of measurement, Scale: Scale and its types, Construction of Plain Scale, Diagonal Scale, Comparative Scale, Vernier Scale, and Time Scale and their uses, Map Projection: Uses and Methods of Map Projection, Map Designing: Cartographic Map Symbol, basics of Map Designing, Lettering, Coordinates: The earth and the earth coordinates, National Grid System, Grid Reference System, Interpretation of Graphs map, and Charts: Qualitative and Quantitative Thematic Mapping, Representation of Statistical Data, Representation of Relief Data, Contouring, Topographical Sheets, Weather Charts, Nautical Chart. Digital Electronic Maps, Understanding the Google maps, Google Earth.

### Recommended Books

1. *Teaching critical reading skills : strategies for academic librarians. volume 2 reading for evaluation beyond scholarly texts and in the world.* (2023). . Association of College and Research Libraries. February 22 2024
  2. Porterfield, M. J. (2019). Map Use: Reading, Analysis, Interpretation. *Photogrammetric Engineering & Remote Sensing*, 85(4), 251-252.
  3. Singh, G. (2009). *Map Work and Practical Geography*. Vikas Publishing House.
  4. Narayan U. (2014). *Elements of practical geography*. Anmol Publications PVT. February 29 2024
  5. *Practical geography.* (2018). . EBH Publishers (India). February 29 2024.
  6. Zeshen, W., & Müller, J. C. (2017). A knowledge based system for cartographic symbol design. In *Landmarks in Mapping* (pp. 103-116). Routledge.
  7. Hickin, E. J. (2014). *Maps and Mapping. A Cartographic Manual*. Burnaby: RS Graphics and Printing, 74-76.
  8. Kraak, M. J., & Ormeling, F. J. (2013). *Cartography: visualization of spatial data*. Keim, D. A. (2002). Information visualization and visual data mining. *IEEE transactions on Visualization and Computer Graphics*, 8(1), 1-8.
  9. *The world of maps : map reading and interpretation for the 21st century.* (2015). . Guilford Press. February 29 2024
- Kimerling, J. Buckley, A. & Muehrcke, J. (2011). *Use, Reading, Analysis and Interpretation. Esri Press.*

<b>ENG- 321</b>	<b>Functional English</b>	<b>3(3-0)</b>
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Basics of Grammar: Parts of speech and use of articles, Sentence structure, active and passive voice, Practice in unified sentence, Analysis of phrase, clause and sentence structure,

Transitive and intransitive verbs, Punctuation and spelling; Comprehension: Answers to questions on a given text; Discussion: General topics and every-day conversation (topics for discussion to be at the discretion of the teacher keeping in view the level of students; Listening: To be improved by showing documentaries/films carefully selected by subject teachers; Translation skills Urdu to English Paragraph writing, Topics to be chosen at the discretion of the teacher; Presentation skills: Introduction.

Note: Extensive reading is required for vocabulary building

### **Recommended Books:**

1. Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 1. Third edition. Oxford University Press. 1997. ISBN 0 194313492
2. Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 2. Third edition. Oxford University Press. 1997. ISBN 0 194313506
3. Writing. Intermediate by Marie-Christine Boutin, Suzanne Brinand and Francoise Grellet. Oxford Supplementary Skills. Fourth Impression 1993. ISBN 0 19 435405 7 Pages 20-27 and 35-41.
4. Reading. Upper Intermediate. Brain Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1992. ISBN 0 19 453402 2.

<b>IRS-301</b>	<b>Introduction to International Relations</b>	<b>3 (3-0)</b>
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Meaning, Definition, Nature, and Scope of International Relations, Evolution and Development of International Relations, Significance of International Relations, Concept of Nation State, International System and Sub-Systems, Foreign Policy, National Interest, and Diplomacy, Power and Balance of Power, Regionalism and Globalization, State and Non-state Actors, Human Rights in International Relations, Religion, Ethics, Morality and Justice in International Relations, The Role of Economics in International Relations, The Concept of War and Peace in International Relations

### **Recommended Books:**

1. Amstutz, Mark R. International Conflict and Cooperation: An Introduction to World Politics. (Chicago: Brown & Benchmark, 1995)
2. Griffiths, Martin, and Callaghan, Terry O". International Relations: The Key Concepts. London, Routledge, 2003.
3. Henderson, Conway W. International Relations: Conflict & Cooperation at the Turn of the 21st Century Boston: McGraw-Hill, 1998.
4. Jackson, Robert and Sorensen; Georg, Introduction to International Relations Theories and Approaches, Oxford: Oxford University Press, 2003.

5. Papp, Denial S; Contemporary International Relations. (2nd ed). New York: Macmillan, 1988.
  6. Pearson. Frederic S., & Rochester, J. Maertu; International Relations: The Global Conditions in the Late Twentieth Century. New York: Random House, 1988.
  7. Columbus, Theodore. Introduction to International Relations: Power and Justice. New Delhi: Prentice Hall, 1992.
  8. Goldstine, Josha. International Relation. Washington DC: Pearson Education, 2003
- Lawson, Stephanie. International Relations; Cambridge; Polity, 2003.

<b>ISL-321</b>	<b>Islamic Studies</b>	<b>2(2-0)</b>
<p>Introduction to Quranic Studies: Basic Concepts of Quran, History of Quran, Uloom-ul – Quran, Study of Selected Text of Holly Quran: Verses of Surah Al-Baqra Related to Faith(Verse No-284-286), Verses of Surah Al-Hujrat Related to Adab Al-Nabi (Verse No-1-18), Verses of Surah Al-Mumanoon Related to Characteristics of faithful (Verse No- 1-11) ,Verses of Surah al-Furqan Related to Social Ethics (Verse No.63-77), Verses of Surah Al-Inam Related to Ihkam(Verse No-152-154) Study of Selected Text of Holly Quran: Verses of Surah Al-Ihzab Related to Adab al-Nabi (Verse No.6,21,40,56,57,58.),Verses of Surah Al-Hashar (18,19,20) Related to thinking, Day of Judgment, Verses of Surah Al-Saf Related to Tafakar,Tadabar (Verse No-1,14), Seerat of Holy Prophet (S.A.W) I: Life of Muhammad Bin Abdullah ( Before Prophet Hood), Life of Holy Prophet (S.A.W) in Makkah Fundamentals of Islam. (Aqaid, Ibadat, Islamic Dawah etc.); Ethical values, search of the Holy Prophet (PBUH); Islamic Civilization and its effects on humanity. Study of other prominent world religious Study of other prominent world religions and ethical systems in comparison with islamic view point. Multicultural societies.</p>		

#### **Recommended Books**

1. Hameedullah Muhammad, “Emergence of Islam” , IRI, Islamabad
  2. Hameedullah Muhammad, “Muslim Conduct of State”
  3. Hameedullah Muhammad, „Introduction to Islam Mulana Muhammad YousafIslahi,”
  4. Hussain Hamid Hassan, “An Introduction to the Study of Islamic Law” leaf Publication Islamabad, Pakistan.
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<b>GEO-302</b>	<b>Region and Regional Concepts</b>	<b>3(3-0)</b>
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Introduction, concepts, Scope and Characteristics of Regions, Classification of regions, Physiographic Regions of world landscapes, including mountains, plateaus, plains, deserts, and coastal areas., Climatic Regions of World, Forests, Indonesian, Amazon region, Grass land, Pampas, Savanna, Prairie, Deserts of world Cold and Hot desert, Economic Regions, Industry, Agriculture resources and Economic Organization in the world, World bank, BENELUX, IMF, Middle east Regions, Cultural Regions, Historical Regions, South Asia, North Western Europe , North America, Major demographic regions, Political region, Distinguished regions of the World; South Asia, South East Asia, North Asia, Africa, Western Europe, Central Europe, North Europe, North, Central and South America, Australia, Roles of regions in Global development

### **Recommended Books**

1. Nijman, J., Shin, M., Muller, P. O. (2020). *The World Today: Concepts and Regions in Geography*. United States: Wiley.
2. Nijman, J., Shin, M., Muller, P. O. (2020). *Geography: Realms, Regions, and Concepts*. United States: Wiley.
3. *Handbook on the geographies of regions and territories*. (2018). . Edward Elgar Publishing. March 1 2024
4. *Regional Worlds: Advancing the Geography of Regions*. (2017). (n.p.): Taylor & Francis.
5. Nijman, J., Muller, P. O., de Blij, H. J. (2016). *The World Today: Concepts and Regions in Geography*. United States: Wiley.
6. de Blij, H. J., Muller, P. O., Nijman, J., WinklerPrins, A. M. G. A. (2010). *The World Today: Concepts and Regions in Geography*. United States: Wiley.
7. de Blij, H. J., Muller, P. O. (2005). *Concepts and Regions in Geography*. United Kingdom: Wiley.
8. Cole, J. (2003). *Geography of the world's major regions*. Routledge.
9. De Blij, H. J., & Muller, P. O. (2005). *Geography: realms, regions, and concepts*. Wiley.
10. Paasi, A., Harrison, J., & Jones, M. (Eds.). (2018). *Handbook on the Geographies of Regions and Territories*. Edward Elgar Publishing.
11. Jones, M., & Paasi, A. (Eds.). (2017). *Regional worlds: advancing the geography of regions*. Routledge.

<b>CSI-321</b>	<b>Applications of Information and Communication Technologies</b>	<b>3(2-1)</b>
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Overview of computers and programming, Overview of language for e.g. C language C, Basics of structured and Modular programming, Basic Algorithms and problem solving, development of basic algorithms, analyzing problem, designing solution, testing designed solution, Fundamental programming constructs, translation of algorithms to programs, data types, control structures, functions, arrays, records, files, testing programs.

**Recommended Books:**

1. Problem Solving and Program Design in C / 6E Hanly& Koffman Addison-Wesley
  2. C How to Program, 5/E (Harvey & Paul) Deitel & Deitel, ISBN-10: 0132404168 ISBN- 13: 9780132404167 Publisher
  5. Ahmad Hasan, “Principles of Islamic Jurisprudence” Islamic Research Institute, International Islamic University, Islamabad (1993)
  6. Mir Waliullah, “Muslim Jurisprudence and the Quranic Law of Crimes” Islamic Book Service (1982)
  7. H.S. Bhatia, “Studies in Islamic Law, Religion and Society” Deep & Deep Publications New Delhi (1989)
- Dr. Muhammad Zia-ul-Haq, “Introduction to Al Sharia Al Islamia” Allama Iqbal Open University, Islamabad (2001)

<b>GEO-401</b>	<b>Introduction to Geo-statistics</b>	<b>3(2-1)</b>
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Theory, scope, importance and application of Geo-statistics, Quantification in Physical and Human Geography, Descriptive statistics, Mean, Mode, median, standard deviation, Inferential statistics, spatial Statistics, Data management and editing data presentation in GIS, Practical exercise on spatial data management, scatter plot, Histogram and Graphs, Practical exercise on MS. Excel, Types of Statistical maps, thematic map, density map, choropleth map, Practical exercise on statistical mapping, Geo-statistical methods of interpolation, kriging, Correlation and types of correlation, Regression analysis linear and multiple regression, Geographic weighted regression, Spatial autocorrelation and directional influences, Cross validation.

Practical: Exercise related to Statistics, data analysis and transformation using GEODA, SPSS, ARCGIS.

**Recommended Books**

- 1 Chun, Y., & Griffith, D. A. (2013). *Spatial statistics and geostatistics: theory and applications for geographic information science and technology*. Sage.

- 2 Getis, A. (1999). Spatial statistics. *Geographical information systems, 1*, 239-251.
- 3 Hengl, T. (2009). A practical guide to geostatistical mapping.
- 4 Rogerson, P. A. (2014). Statistical methods for geography: a student's guide. *Statistical methods for geography*, 1-424
- 5 *Geostatistics explained : an introductory guide for earth scientists.* (2010). . Cambridge University Press. February 29 2024
- 6 Chil's J.-P. & Delfiner P. (2012). *Geostatistics : modeling spatial uncertainty* (2nd ed.). John Wiley & Sons. February 29 2024
- 7 Geostatistics for Environmental Applications Workshop Atkinson P. M. & Lloyd C. D. (2010). *Geoenv vii - geostatistics for environmental applications : proceedings of the seventh european conference on geostatistics for environmental applications.* Springer. February 29 2024
- 8 Pilz, J. (Ed.). (2009). *Interfacing geostatistics and GIS.* Springer Berlin Heidelberg.
- 9 Burt J. E. Barber G. M. & Rigby D. L. (2009). *Elementary statistics for geographers* (3rd ed.). Guilford Press.
- 10 *Quantitative geosciences : data analytics geostatistics reservoir characterization and modeling.* (2019). . Springer. February 29 2024

<b>GEO-403</b>	<b>Surveying and Leveling</b>	<b>3(2-1)</b>
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Orientation, Scope, Objectives and Uses of Surveying and Leveling, Primary division and fundamental principles of surveying, Classification of Surveying and leveling based on Instruments, Methods and nature of field, Map descriptions and types, Methods of expressing scales, British and International Metric Systems, General description of the instruments, Basic terminologies, Types of compass: Compass Survey, Designation of Bearings, WC,BQ, RB, Temporary Adjustment of Compass, Types of Prismatic Compass Traverses, Calculation of angles; Leveling: Adjustments, Principles, Field Procedure, Curvature and Refraction, Methods of determining Reduced Level, Collimation Method, Rise and Fall Method, Difficulties during Leveling, Accuracy required in leveling operation, Advantage and source of errors in leveling procedure, Clinometer: General Description, Use of Instruments, Height Measurement, Calculation, Advantages and disadvantages, Theodolite surveys and advance surveying, Level Field Survey through different kinds of Levels (Simple, Differential, Fly, Reciprocal, Check, Longitudinal Levelling or Profile, Precise, Barometrical and Trigonometrical Levelling), Curvature and Refraction, Methods of Determining Reduced Level, Difficulties During Levelling, Advantage and Source of errors in leveling procedure. An Introduction of Contouring, Typical Land Features and Their Contour Forms, Characteristics of Contours, Methods of Contouring, Interpolation of Contours, Plotting of

Contours, Methods, types, and description of Clinometer, Methods, types, and description of Theodolite Surveys, Field Survey through Theodolite, Adjustment of Instrument, Measurement of horizontal and vertical angles, Sketching, Errors, Total Station Survey, Features of Total Station, Setting up and Orientation of Total station, Electronic Data Recording, Field Procedure in Total station,

### Recommended Books

1. *Surveying and geomatics engineering : principles technologies and applications.* (2022). . American Society of Civil Engineers. February 22 2024
2. Open Textbook Library. (2021). *Surveying and mapping.* TU Delft Open. February 22 2024
3. K Barry, M Tom (2014). *Surveying Principle and Applications:* Pearson.
4. J. Aylmer (2014). *Plane And Geodetic Surveying.* Taylor & Francis Group, Llc
5. Bannister, R. Stanley, R. Baker (2011). *Surveying* 7<sup>th</sup> edition. Pearson
6. Bannister,A., Raymond, S., Baker, R., (2013). *Surveying.* *Pearson.*
7. Satheesh Gopi, R. Sathikumar, N. Madhu (2010). *Advance Surveying* Third edition. Pearson
8. Gopi, S., Sathikumar, R., Madhu, N., (2010). *Advanced Surveying (Total Station, GIS and Remote Sensing)* *Pearson.*
9. Duggal, S. K. (2009) *Surveying. The McGraw-Hill Companies.*  
Czaja, R. F., Blair, J., Blair, E. A. (2014). *Designing Surveys: A Guide to Decisions and Procedures. United Kingdom: SAGE Publications.*

<b>GEO-405</b>	<b>Fundamentals of GIS</b>	<b>3(2-1)</b>
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**Theory:** Nature and scope of GIS, Introduction to mapping components and its representations, Key Components, Functional Sub-system; Spatial Data Acquisition: Date Capturing Devices; Techniques and Procedures; Nature of Spatial Data types and Models: Raster Data Models, Vector Data Models, Attribute Data Models: Tabular Data Models, Network Data Model, Hierarchical Data Models, Relational Data Model, Object Oriented Data Model; Coordinate System: Geographic Coordinate System, Projected Coordinate System, Earth Shape models, Modeling Spatial world, Data Conversion, Data Analysis, Map Display

**Lab work:** ArcGIS Interface and its Extensions, Introduction to GIS Lab (hardware/software), Raster/Vector /Attribute Data Display, Geo-referencing, digitizing, attribute data management, Application of different queries, qualitative and quantitative maps, layout making, Topology, Use of Arc Scene Introduction to Open source and commercial software, Coordinate Systems, Handheld GPS based survey. Incorporation of spreadsheet data with GIS, preparation of Map.

### Recommended Books

1. *Geographic information system*. (2020). . Sumit Pal Jain for New India Publishing Agency. February 22 2024
2. Aronoff, S. (2005) *Remote Sensing for GIS Managers*, ESRI Press, Redlands.
3. Chang, K. (2012) *Introduction to Geographic Information Systems*, McGrawHill Company, New York.
4. Pandey J. Pathak D. & Energy and Resources Institute. (2014). *Geographic information system*. Energy and Resources Institute. February 22 2024
5. Clarke, K. (2004) *Getting started with Geographic Information System*, Prentice Hall, New York.
6. Duckham, M., Michael, F. (2003) *Foundations of Geographic Information Science*, Taylor & Francis, USA.
7. Haining, R. (2003) *Spatial Data Analysis, Theory and Practice*, Cambridge University Press, USA.
8. Heywood, I., Cornelius, S. & Carver, S. (2003) *An introduction to Geographic Information System*, Addison Wesley Longman, New York.
9. Sullivan, D. & Unwin, D. J. (2003) *Geographic Information Analysis*, John Wiley & Sons, Inc., Canada.

ACH-411	Applied Chemistry for Geographers	3(3-0)
<p>Applied Chemistry in Geography: Basic principles of chemistry relevant to geography, atomic structure, chemical bonding, and molecular geometry. Minerals and Rocks: Chemical composition of minerals and rocks, Crystallography and mineral identification techniques, Geochemical processes governing mineral formation and alteration. Aqueous Geochemistry: Properties of aqueous solutions, Acid-base equilibrium and pH in natural waters, Geochemical cycling of elements in the Earth's crust and hydrosphere. Organic Chemistry in Geography: Introduction to organic compounds in the Earth's crust, Fossil fuels and hydrocarbon exploration, Biogeochemical cycling of organic matter. Isotopes in Geochemistry: Principles of isotopic fractionation, Stable and radiogenic isotopes in geological processes, Applications of isotopic geochemistry in dating and tracing geological materials. Environmental Geochemistry: Contaminant transport and fate in natural systems, Remediation techniques for polluted environments, Geochemical proxies for environmental reconstruction. Analytical Techniques in Geochemistry, instrumental methods in geochemical analysis, X-ray diffraction, spectroscopy, and mass spectrometry. Review and Applications: Case studies illustrating the application of chemistry in solving geological problems, Discussion of future trends and research directions in applied geochemistry.</p>		

**Resources:**

1. Applied Geochemistry: Advances in Mineral Exploration Techniques By Athanas S. Macheyeke, Dalaly Peter Kafumu, Xiaohui Li, Feng Yuan · 2020, Elsevier Science
2. Geochemistry, By William M. White · 2020. Wiley
3. Journal articles and research papers on relevant topics in applied geochemistry
4. Online resources and databases for geological and geochemical data analysis

<b>GEO-402</b>	<b>Human Geography</b>	<b>4(4-0)</b>
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Introduction: Definition, Domains, Scope and Applications of Human Geography, Man Environment Relationship: Determinism, Possibilism and perception, Environmental Problems; Population Growth/ Change: Components, causes of Rapid population growth, Malthus Theory of Population, Demographic Transition Theory; Urbanization: Causes, Overview of Urbanization along with future prospects, Mobility determinations, Push and Pull factors, Types of Migration, Push and Pull Factor, consequences factor; classification of principle religion, race; major racial groups and their distribution, Settlements: Classification of settlements (central place theory), urban and rural settlements (forms, functions and classification); Economics activities Primary and Secondary economic activities, Tertiary economic activities Quaternary & Quinary economic activities; concepts in cultural geography, Lab: construction of maps and diagrams to show world distribution of population, religions, languages and races, age sex pyramids of different countries, calculation of rates and ratios to population, construction of maps, and diagrams to show economic activities, work distribution economic activities, world distribution of major crops fishing grounds, major minerals, major industrial goods, trade pattern.

**Recommended Books**

1. Open Textbook Library. (2023). *Human geography*. VIVA. February 22 2024
2. *The cultural landscape : an introduction to human geography* (Thirteenth). (2020). . Pearson.
3. *Human geography (Tenth)*. (2019). . Oxford University Press.
4. Fouberg E. H. (2020). *Human geography*. John Wiley & Sons Incorporated. February 29 2024
5. *Human geography* (Tenth). (2019). . Oxford University Press.
6. Fellmann J. D. (2013). *Human geography : landscapes of human activities* (Twelfth). McGraw Hill.
7. Fouberg, E. H., Murphy, A. B., & De Blij, H. J. (2009). *Human geography: people, place, and culture*. John Wiley & Sons.
8. De Blij, H. (2008). *The power of place: Geography, destiny, and globalization's rough landscape*. Oxford University Press.
9. Gregory, D., Johnston, R., Pratt, G., Watts, M., & Whatmore, S. (Eds.). (2011). *The dictionary of human geography*. John Wiley & Sons.

10. Elsevier (Firm). (2020). International encyclopedia of human geography (Second). Elsevier. February 29 2024

<b>GEO-404</b>	<b>Global Positioning Systems</b>	<b>3(2-1)</b>
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Evolution of the GPS, GPS Performance Requirements: Where Are the Satellites? Earth Geometry Radio-Navigation Systems; GPS Civil Applications; GPS Segments: Orbits; Satellite Ranging: Two-Way vs. One-Way Ranging; Single Range to Single Satellite; Two Ranges to Two Satellites; Three Ranges to Three Satellites; Why Four Satellites?: Clock Timing Error; Multi-Path Errors: Levels of GPS Service: Basic Signal Structure: Pseudo-Random Codes: Measurement of Pseudo range: Cycle slips: GPS Signal Structure Map: Signal Strength: GPS Resolution - C/A-Code: C/ A Code and Data Format; Generation of C/ A Code; Correlation Properties of C/ A Code: GPS Resolution - P-Code: Anti-Spoofing (A/S): Carrier-Phase Positioning: GPS Resolution - Carrier-Phase: GPS Velocity: Ionospheric / Tropospheric Refraction: Satellite Mask Angle: Selective Availability: Position Offsets: Absolute Accuracy: GPS Errors; GPS ephemeris errors; Selective availability; Satellite and receiver clock errors; Multipath error; Antenna-phase-center variation; Receiver measurement noise; Ionospheric delay; Tropospheric delay. GPS Positioning Modes; GPS point positioning; GPS relative positioning; Static GPS surveying; Fast(rapid)static; Stop-and-go GPS surveying; RTKGPS; Real-time differential GPS

Lab: Use of GPS Device, use GPS information for preparing accurate surveys and maps, taking precise time measurements, tracking position or location, and for navigation, import GPS data into ARC GIS, Convert them into Shapefile and prepare map.

### Recommended Books

1. Gps for success : skills strategies and secrets of superachievers (1st ed.). (2022). . Productivity Press. March 1 2024
2. GPS and GNSS technology in geosciences. (2021). . Elsevier. March 1 2024
3. *Inside gps*. (2019). . Core Library an imprint of Abdo Publishing. March 1 2024
4. *Gps technology*. (2019). . Cody Koala an imprint of Pop! March 1 2024
5. GPS. (2016). Berlin: Springer-Verlag Berlin and Heidelberg GmbH & Co. KG.
6. Kennedy, M. (2002). The global positioning system and GIS: An introduction. London: Taylor & Francis.
7. Prentzas, G. S. (2010). GPS. Ann Arbor, Mich: Cherry Lake Pub.

8. Rao, B. R., Kunysz, W., & McDonald, K. (2012). *GPS*. Norwood: Artech House.
9. Van Sickel, J. (2023). *GPS and GNSS for Land Surveyors*. CRC Press.
10. Prentzas G. S. (2010). *GPS*. Cherry Lake Pub. March 1 2024

<b>GEO-406</b>	<b>Physical Geography</b>	<b>4 (4-0)</b>
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Introduction: Scope, aim and major Branches of Physical Geography, Lithosphere, Internal Structure of Earth, Rocks, origin, formation and types: Igneous, Sedimentary and Metamorphic Rock, Plate tectonics, Geomorphic Processes, Endogenic and Exogenic Processes, Continental Drift Theory, Lithospheric Plates, Earthquakes, Volcanic Activity, Cycle of Erosion, Landforms produced by Running Water, Erosional and Depositional Landforms of Wind, Erosional and Depositional Landforms of Glaciers, Weathering, Mass Wasting, Land Sliding; Atmosphere: Atmospheric Composition, Structure of Atmosphere, Greenhouse effect, Heating of Atmosphere, Energy Budget of Earth, Hydrosphere, Hydrological Cycle, Oceans of the Worlds, Thermohaline Circulation in Oceans. Biosphere, Eco-systems, Formation and types of soils

**Recommended Books:**

1. Petersen J. F. Sack D. I. & Gabler R. E. (2022). *Physical geography*. Cengage.
2. *Physical geography (Second)*. (2022). . Routledge Taylor & Francis Group. February 29 2024
3. Open Textbook Library. (2020). *Physical geography (Version 1)*. College of the Canyons. February 29 2024
4. Petersen J. F. Sack D. I. & Gabler R. E. (2022). *Physical geography*. Cengage. Holden, J. (2021). *Physical geography: the basics*. Routledge.
5. Christopherson, R. W. (2013). *Geosystems: An Introduction to Physical Geography*: Pearson.
6. Christopherson, R. W., Birkeland, G. H., Giles, P. T., & Byrne, M. L. (2015). *Geosystems: An Introduction to Physical Geography, Fourth Canadian Edition*: Pearson Education Canada.
7. Gabler, R. E., Petersen, J. F., Trapasso, L. M., & Sack, D. (2008). *Physical Geography*: Cengage Learning.
8. Lyons, R. R. (2014). *Introduction to Physical Geography*: Kendall Hunt Publishing Company.
9. Petersen, J. F., Sack, D., & Gabler, R. E. (2016). *Physical Geography*: Cengage Learning.
10. Strahler, A. H. (2013). *Introducing Physical Geography, 6th Edition*: Jhon Wiley & Sons.

<b>GEO-501</b>	<b>Geomorphology</b>	<b>3(3-0)</b>
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Scope and status of geomorphology, Geomorphic concepts/principles/systems, Factors of landform development; structure, process and geological time scale, Structure of the interior Earth and its role in landscape development, Endogenic Processes, Isostasy, Diastrophism, Continental drift, Plate tectonic, Volcanism, Earthquakes, Exogenic Processes, Weathering and its types, Mass wasting, Role of weathering in landscape change, Cycle of erosion, Fluvial concepts, Fluvial Geomorphology, Fluvial Processes, Fluvial Sediments, and Fluvial Landforms, Fluvial processes, Stages of rivers, Fluvial landforms, Erosional, Transportation, Depositional, Glacial Geomorphology, Glaciation, Glacial Sediments, Glacial Landforms, and Peri glacial Processes, Past glaciation, Formation of glaciers, Types of glaciers, glacier as geomorphic agent, glacial erosion and depositional landforms, Eolian Geomorphology, Eolian Processes and landforms, Wind as geomorphic agent, Eolian erosional landforms, transportation by wind, Eolian depositional landforms, Coastal and Karst Landforms, Karst Landforms, Ground water, Porosity and permeability of rocks, Aquifers, Karst topography and associated landforms, Sea wave as geomorphic agent; erosional and depositional landforms, Soil Geography, Soil development, Factors of soil formation, physical and chemical properties of soil, soil profile, texture and structure, types of soils.

Lab Work: Lab work must be conducted for soil, rocks and minerals recognition where relevant material is readily available. Geomorphic profiles, theories of Uniformitarianism and Catastrophism, the history of geomorphological research and relevance to modern research, use of Remote sensing techniques for the interpretation of landforms and geomorphic features; Field Visit: Field trips to accessible areas for in-depth geomorphic studies.

**Recommended Books:**

1. Hart M. G. (2020). *Geomorphology*. Taylor & Francis Group. February 22 2024
2. *Geomorphology*. (2019). Routledge. March 1 2024
3. *Introducing geomorphology : a guide to landforms and processes (Second)*. (2022). Dunedin Academic Press. March 1 2024
4. Ramasamy S. (2021). *Remote sensing in geomorphology*. New India Publishing Agency (NIPA). March 1 2024
5. Waele J. de & Gutiérrez F. (2022). *Karst hydrogeology geomorphology and caves*. Wiley. March 1 2024
6. *Aeolian geomorphology : a new introduction*. (2019). John Wiley & Sons. March 1 2024

7. Burbank, D. W. & Anderson, R. S. (2011) *Tectonic Geomorphology: A Frontier in Earth Science*, Blackwell Science, New Jersey.
8. Ritter, D. F., Kochel, R. C. & Miller, J. R. (2011) *Process Geomorphology*, McGraw-Hill, New York.
9. Wooldridge, S. W. & Morgan, R. S. (2009) *An Outline of Geomorphology: The Physical Basis of Geography*. Longmans. London /New York.
10. Bierman, P.R and Montgomery, D.R. (2014) *Key Concepts in Geomorphology*. New York, W.H. Freeman and Company
11. Geoinformatics in Applied Geomorphology. Anbazhagan, S.; Subramanian, S. K. and Yang X., 2011. CRC Press, Taylor & Francis Group, London and New York

<b>GEO-503</b>	<b>Climatology</b>	<b>3(3-0)</b>
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Definition, scope, and impact of climatology, Branches of climatology, Composition and structure of climatology, Insolation, Earth's Radiation Budget, Energy, and Temperature, Humidity and types in Atmosphere, Air masses and Fronts, Winds, permanent and local winds and atmospheric Pressure, Precipitation forms and types, Clouds classification, Factors and controls on climate, The atmospheric circulation, oceanic circulation, EL-NINO, Ocean Currents, Cyclones, Anticyclones, Tornadoes and types, Forest fire, Lightning and thunderstorm, Tropical Weather and Climate, Extra-Tropical Weather and Climate, Local Climates, Human Interaction with the Climate, Urban Heat Island, Ozone depletion, Climate regions of Pakistan, Climate Change and extreme events, koppen climatic classification and Thorn wait climatic classification

### **Recommended Books**

1. *Climatology* (Fourth). (2018). . Jones & Bartlett Learning.
2. Vega A. J. (2017). *Climatology* (4th ed.). Jones & Bartlett Learning LLC. March 1 2024
3. *Climatology in cold regions*. (2023). . John Wiley & Sons. March 1 2024
4. *Selected readings in applied climatology*. (2015). . Cambridge Scholars Publishing. March 1 2024
5. Nicholson S. E. (2011). *Dryland climatology*. Cambridge University Press. March 1 2024
6. *Principles of climatology* ([First edition]). (2018). . Salem Press a division of EBSCO Information Services Inc. ; Grey House Publishing. March 1 2024
7. Bridgman, H. A., & Oliver, J. E. (2014). *The global climate system: patterns, processes, and teleconnections*. Cambridge University Press.
8. Hartmann, D. L. (2015). *Global physical climatology* (Vol. 103). Newnes.
9. Robinson, P. J., & Henderson-Sellers, A. (2014). *Contemporary climatology*. Routledge.

10. Rohli, R. V., & Vega, A. J. (2017). *Climatology*. Jones & Bartlett Learning.
11. Shukuya, M. (2019). *Bio-Climatology for Built Environment*. CRC Press.
12. Vega, M., Vega, A. J., & Rohli, R. V. (2012). *Louisiana Weather and Climate*. Jones & Bartlett Publishers.

<b>GEO-505</b>	<b>Economic Geography</b>	<b>3(3-0)</b>
<p>Introduction: Economic geography today, classifying economic activity, production, Exchange, Consumption, The meaning of geography, Definition of Economic geography, Economic activity Pattern, locational analysis , Trade as spatial interaction , population and development issues in developing world Evolution of world economic systems: Medieval feudal economics, economic impacts of mercantilism , Emergence of Colonialism, economic impacts of colonialism, Modern world economic systems: Socialism, Communism, Capitalism, Mixed economy, Islamic economic system, Concept of natural resources and reserves, Human resource and its development, Classification of economic activities, Primary activities, gathering, hunting, herding, substance, intensive and extensive farming, commercial grain farming, livestock farming, dairying, mixed farming, plantation farming, lumbering, fishing and mining, Green revolution and its implications, Secondary activities: Tertiary activities, Trade and functions, Transport systems, Quaternary and Quinary activities, Regional inequalities, sustainable development and poverty alleviation, Impacts of Globalization, Recent Industrial development, Manufacturing Theories , The manufacturing process and Location, standard industrial classification, Measurement, Classical Location principles, least cost, Substitution, Profit maximization, Spatial margins, Interdependence, Central place theory, Criticism on classical theory, Contemporary Behavioral and Structural Approach, Behavioural location theory, Structural approach, Cities as service center , world city pattern, Rank size rule, Urban retail hierarchy, Breaking Point theory, Law of Retail gravitation, Commercial Activity in the City, Stages of suburban development, Rostov stages of Development, Shopping centers hierarchy, Ribbon Corridors, Trade area analysis, Wholesale activity, Hotel activity, Geography of International Business, International Trade dynamics, International business strategies, Free trade initiatives;</p>		

**Recommended Books:**

1. Bhat, L. S., Sharma, H. S., Qureshi, M. H., Ramachandran, H., Vyas, R., & Indian Council of Social Science, R. (2016). *Economic geography*.
2. Leyshon, A., Lee, R., McDowell, L., & Sunley, P. (2013). *The SAGE handbook of economic geography*, from

3. Martin, R. L., & Sunley, P. (2009). *Economic geography*. London; New York: Routledge.
4. Martin, R. L., & Sunley, P. J. (2008). *Economic geography. Vol. 1 Vol. 1*. London: Routledge.
5. SAlnwick, H., & Rees, H. (2012). *A geography of commodities*. London: Harrap.  
Aoyama, Y., Murphy, J. T., & Hanson, S. (2010). *Key Concepts in Economic Geography*: SAGE Publications.
6. Indian Council of Social Science Research. (2016). *Economic geography (First)*. Oxford University Press. March 1 2024
7. *Economic geography*. (2015). . Routledge. March 1 2024
8. Aoyama, Y., Murphy, J. T., Hanson, S. (2010). *Key Concepts in Economic Geography*. United Kingdom: SAGE Publications.
9. Hodder, B. W., Lee, R. (2015). *Economic Geography*. United Kingdom: Taylor & Francis.
10. Wood, A., Roberts, S. (2012). *Economic Geography: Places, Networks and Flows*. United Kingdom: Taylor & Francis.

<b>GEO-507</b>	<b>Geographic Thought and Modern Concepts</b>	<b>3(3-0)</b>
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Themes and Characteristics of Geographical work, Basic themes of Geography, The essential characteristics of Geographical work, Fundamental Principles of surveying, Geography and the rise of scientific revolution, The contextual approach to the history of ideas, Ages in the development of Geographical Thoughts, Classical age, Greek Scholars, Roman Scholars, Dark age, Muslim age, Contribution of Arab Scholars, European Renaissance, Modern developments, Development of Theories, Theory of Environmental Determinism, Geography and Theory of Environmental Determinism, Arabs and European Scholars contribution in the theory, Critical approach in the Theory of Environmental Determinism; The foundations and developments up to Eighteen Century, The contribution of Immanuel Kant, Proceeding towards development of Geography as a discipline, Geography in the Nineteenth Century: The age of Humboldt 1790-1859, Science and Philosophy at the End of Eighteenth Century, Alexander Von Humboldt, Carl Ritter (1779-1859) and His contribution to Geography as a Discipline, Legacy of Humboldt and Ritter Eminent followers of Humboldt and Ritter, Geography as a science of spatial analysis, On nature of Positivist explanation, Geography and Environmentalism, Man, nature relationship, The current view of man environment relations, Regional concepts and regional geography, The Cultural Tradition in Geography, Location and spatial organization, Time and spatial diffusion, Spatial diffusion: toward regional convergence, The Area Analysis Tradition in Geography, Urbanization, City chain

and hierarchies, Territories and boundaries, Rich countries and poor, Inequalities within countries: Welfare issues in Regional Planning, Future tasks in Geography, New directions in Geography, Remote sensing and GIS, Geography and Planning.

### Recommended Books

1. Others A. C. S. A. (2023). *Darwin and modern science*. Double 9 Books. February 22 2024
2. Cresswell T. (2012). *Geographic thought : a critical introduction* (1st ed.). Wiley. February 22 2024
3. GEOGRAPHICAL THOUGHT: A CONTEXTUAL HISTORY OF IDEAS. (2018). (n.p.): PHI Learning Pvt. Ltd.
4. *Themes in Geographic Thought (Routledge Revivals)*. (2014). United Kingdom: Taylor & Francis.
5. *Spaces of Geographical Thought: Deconstructing Human Geography's Binaries*. (2005). India: SAGE Publications.
6. Rana, L. (2008). *Geographical thought*. India: Concept Pub. Co..
7. Cresswell, T. (2013). *Geographic Thought: A Critical Introduction*. United Kingdom: Wiley.
8. Nayak, A., Jeffrey, A. (2013). *Geographical Thought: An Introduction to Ideas in Human Geography*. United States: Taylor & Francis.
9. Newbiggin, M. I. (2022). *Modern Geography*. Czechia: DigiCat.
10. Hagget, P., (1991). *Geography; A Modern Synthesis*, New York, Harper & Row

GEO-509	Remote Sensing	3(2-1)
History, Scope and Concept of Remote Sensing; Elements of Remote Sensing, Energy sources of illumination, Electromagnetic radiation its characteristics and different parts of Spectrum Radiation and the Atmosphere energy interaction with atmosphere, scattering and its types, Absorption Atmospheric Window, Energy interaction with earth surface features Absorption, Transmission and Reflectance, Specular and Diffuse reflectance Spectral Reflectance Curves, Water, Vegetation and Soil Image Characteristics, Recording of Energy by sensor, Platforms (Types and Orbital Characteristics) sensor types and their characteristics, Image resolution types, Swath width, Data reception and processing, Major components in digital image processing for radiometric correction, Image Rectification and registration, Image Enhancement, Mosaicking and sub-setting, Interpretation and Analysis visual image interpretation, Digital Image processing overview. Applications Overview, Lab Outline: Introduction to labs, Overview of Image Processing Software (e.g. ERDAS Imagine, ENVI, Orfeo, Tollbox Image Georeferencing, Layer stacking, Image Mosaicking, Extraction of		

AOI (Subsetting), Color composite Various sensors data comparison, Feature recognition, Image classification (Unsupervised and Supervised).

### Recommended Books

1. Campbell, James B. (2011). Introduction to Remote Sensing, 5<sup>th</sup> Ed. The Guilford Press.
2. Foody, G.M. & Curran, P.J. (1994). Environmental Remote Sensing from Regional to Global scales, John, Wiley & Sons. Inc. 250 p.
3. Gibson, P. J (2000). Introductory Remote Sensing: Principles and Concepts Rutledge.
4. Lillesand, T. M. & Kiefer, R. W. (2010). Remote Sensing and Image Interpretation, 6<sup>th</sup> edition. Jhon Wiley and Sons Inc.
5. Lulla, K.& Dessinov, L.V. (2000). Dynamic Earth Environmental: Remote Sensing Observations from shuttle Mir Mission John, Wiley & Sons. Inc.288 p.
6. Rancez, A.N. (1999). Remote Sensing for the Earth Sciences. John Wiley & Sons Inc. 728 p.
7. *Remote sensing*. (2021). . IntechOpen. March 4 2024
8. Khorram S. (2012). *Remote sensing*. Springer. March 4 2024
9. *Remote sensing and geographical information systems : environment risk prediction and safety*. (2021). . Nova Science. March 4 2024
10. *Remote sensing techniques and gis applications in earth and environmental studies*. (2021). . Delve Publishing. March 4 2024

<b>GEO-502</b>	<b>Research Methodology</b>	<b>3(3-0)</b>
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Introductory and overview, Meanings, aims and objectives of Research, Motivation in research, Types of research, Descriptive vs. Analytical Research; Applied vs. Basic/Fundamental Research, Conceptual vs. Empirical Research; Exploratory vs. Formalized Research; Clinical Research, Decision Oriented vs. Conclusion Oriented Research, One time Research vs. Longitudinal Research, Field based vs. laboratory Simulation Research, Qualitative and Quantitative Research Approaches, Significance/Need/Importance of Research, Research Methods and Research Methodology, Research in Geography, Importance of research methodology, Criteria of a good research, Problems faced by Researchers while carrying out research (Pakistan Perspective), Research Process: An overview of the whole research process, Selecting/Defining a research problem, Statement and illustration of research problem, Research Design and preparing synopsis: Meaning of research design, Need of research design, Qualities of a good research design, Formulating research problem, purpose and setting the objectives, Research question and hypothesis, Variables: Dependent and independent, Data collection, Tools and techniques of

primary data collection, Secondary data collection, Observations: Participatory and non-participatory observation method, Key informants interviews: Telephonic interviews and scheduled interviews, Focused Group Discussions (FGDs), Questionnaire Survey: Types, importance, merits and demerits of questionnaire survey, Sampling design: Census and sample surveys, merits and demerits, Steps in sampling: Defining the universe, sampling unit, source list or sampling frame, sample size, parameters of interest, Selection of sampling design, Non-Probability sampling, Convenience sampling, Judgment sampling, Probability sampling (random sampling), Systematic sampling, Stratified sampling, Cluster sampling, Multistage sampling, Probability proportional to size sampling

### **Recommended Books:**

1. Kothari, C. R. (2019). *Research Methodology: Methods and Techniques*. India: New Age Publishers Pvt Limited.
2. *Research Methods in Geography: A Critical Introduction*. (2010). Germany: Wiley.
3. Kitchin, R., Tate, N. (2013). *Conducting Research in Human Geography: Theory, Methodology and Practice*. United Kingdom: Taylor & Francis.
4. Knight, J., Whalley, B. W. (2020). *Research Methods in Physical Geography*. (n.p.): Taylor & Francis Group.
5. Kumar, R. (2018). *Research Methodology: A Step By Step Guide For Beginners*, 2/E. India: Pearson Education.
6. Goddard, W., Melville, S. (2004). *Research Methodology: An Introduction*. South Africa: Juta.
7. Kumar, R. (2014). *Research Methodology: A Step-by-Step Guide for Beginners*. United Kingdom: SAGE Publications.
8. Bhandarkar, P. L., Wilkinson, T. S., Laldas, D. K. (2010). *Methodology & Techniques of Social Research*. India: Himalaya Publishing House.
9. Kothari CR (2004) *Research Methodology: Methods and Techniques*. New Age International (P) Ltd., Publishers Delhi, India.
10. Haring LL et al., (1992) *Introduction to scientific geographic research*. Oxford

<b>GEO-504</b>	<b>Geographic Information Sciences</b>	<b>3(2-1)</b>
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Introduction to GIS, Definition nature and scope, Components of GIS, Functional subsystems, Applications of GIS in solving real life problems, Spatial data, Types, Sources, Coordinate systems and earth shape models, GIS data models, Spatial data models, Attribute data models in GIS, Modeling surfaces, Modeling networks, Modeling third and fourth dimensions, Attribute data management, Spatial Analysis and Modeling, A conceptual model to solve a

spatial problem, Vector analysis, Raster Analysis, Topology, Adjacency, Containment, Connectivity, How we create a topological vector model in computer database concept of each spatial analysis, its data nature, inventory and application and its processing on arc map; Practical: Qualitative and quantitative analysis, Vector and raster analysis, Usage and application of Analysis tool box, Data extraction, Overlay, Proximity, Statistics, Geo-Statistical Analyses' tool usage, 3D Analysis, TIN management in Arc Scene, Area calculation, Contour Making, Conversion tool, Use of Arc Scene, Layout making, Conditional , Density , Groundwater , Hydrology , Interpolation , Surface analysis, Conversion tool usage, Zonal Statistic

### **Recommended Books**

1. ADVANCED GEOGRAPHIC INFORMATION SYSTEMS -Volume I. (2009). United Kingdom: EOLSS Publications.
2. Geoinformatics for Geosciences: Advanced Geospatial Analysis Using RS, GIS and Soft Computing. (2023). Netherlands: Elsevier Science.
3. Farkas, G. (2017). Practical GIS. United Kingdom: Packt Publishing.
4. Gopi, S. (2007). Advanced Surveying: Total Station, GIS and Remote Sensing. India: Pearson Education.
5. Spatial Big Data, BIM and Advanced GIS for Smart Transformation: City, Infrastructure and Construction. (2020). Switzerland: Mdpi AG.
6. W. Allen, D., M. Coffey, J. (2017). GIS Tutorial 3: Advanced Workbook. (n.p.): CreateSpace Independent Publishing Platform.
7. Bolstad, P., Manson, S. (2022). GIS Fundamentals: A First Text on Geographic Information Systems. United States: Elder Press.
8. Remoaldo, P. C., Ribeiro, V. P., Lopes, H. S., & Silva, S. C. G. (2019). Geographic Information Systems. In *Advanced Methodologies and Technologies in Engineering and Environmental Science* (pp. 334-348). IGI Global.
9. Longley, P. A., Goodchild, M. F., Maguire, D. J., & Rhind, D. W. (2015). *Geographic information science and systems*. John Wiley & Sons.
10. Chang, K. T. (2006). *Introduction to geographic information systems* (pp. 117-122). Boston: McGraw-Hill Higher Education.

<b>GIS-504</b>	<b>Spatial Data Analysis</b>	<b>3(2-1)</b>
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Introduction to spatial data types, Potentials of spatial data, Modeling and storing field data, Cluster analysis, Spatial Interaction analysis, Boundary Analysis, Spatial Analyses, Point pattern analysis, Spatial Autocorrelation Buffering, proximity and neighborhood functions, Spatial Interpolation interpolation, type, Methods/algorithms, Derived measures on surface Polylines, network Analysis, Area objects and types of area objects; Geometric properties of a reasMap overlay, Vector and raster overlay operations, Ordinary Least Squares & Geographically weighted Regression, Techniques, Problems in simple Boolean polygon overlay, Multivariate data and multidimensional space, New approaches to spatial analysis Surface modeling, DTM/DEM/DSM, Multi-criteria and Multi-attribute Decision Making, Uncertainties in spatial modeling.

**Practical:** Assignment on Spatial Analysis for various applications Geocoding, Point analysis exercise Interpolation of point data and surface modeling, Network analysis exercise, Aerial analysis exercise, Buffer analysis exercise, Multivariate analysis, Assignment on advanced spatial analysis, Suitability analysis, Risk Modeling, Assignment on uncertainties in spatial modeling.

### **Recommended Books**

1. Carlin, B. P., Gelfand, A. E., & Banerjee, S. (2014). *Hierarchical modeling and analysis for spatial data*. Chapman and Hall/CRC.
2. Watson, D. (2013). *Contouring: a guide to the analysis and display of spatial data* (Vol. 10). Elsevier.
3. Guptill, S. C., & Morrison, J. L. (Eds.). (2013). *Elements of spatial data quality*. Elsevier.
4. Schabenberger, O., & Gotway, C. A. (2017). *Statistical methods for spatial data analysis*. Chapman and Hall/CRC.
5. Gelfand, A. E., Diggle, P., Guttorp, P., & Fuentes, M. (Eds.). (2010). *Handbook of spatial statistics*. CRC press.
6. Fotheringham, S., & Rogerson, P. (Eds.). (2014). *Spatial analysis and GIS*. CRC Press.
7. Longley, P. A., Goodchild, M. F., Maguire, D. J., & Rhind, D. W. (2015). *Geographic information science and systems*. John Wiley & Sons.
8. *An introduction to spatial data analysis : remote sensing and gis with open source software*. (2020). . Pelagic Publishing. March 4 2024

9. Fischer M. M. & Wang J. (2011). *Spatial data analysis : models methods and techniques*. Springer. March 4 2024
10. Adjustment computations : spatial data analysis (Sixth). (2018). . John Wiley & Sons. March 4 2024
11. Lloyd C. D. (2010). *Spatial data analysis : an introduction for gis users*. Oxford University Press. March 4 2024

GEO-508	Geography of Pakistan	3(3-0)
<p>Introduction, Geo-strategic position of Pakistan, Location and Geographical significance, Geo-political Importance, Administrative setup , Land and Physical Environment, Physiography, Climate and climatic regions , Hydrology o Soils and vegetation , The People , Population characteristics: structure, composition and distribution , Population Change, Urbanization , Economy ,Agriculture (crops and livestock),Irrigation, Power and mineral resources, Industries, Trade, Tourism ,Transport and Communication , Major challenges of Pakistan , Water, power, security and environmental issues. Lab Work: Survey, data collection and presentation on different thematic maps Field visits: To identify various physical regions and study of at least one region's land use, urban structure, mining area, national parks, industrial areas and various rural and urban settlements and other natural resources.</p>		

#### **Recommended Books:**

1. Chapman, G. P. (2016). *The geopolitics of South Asia: From early empires to the nuclear age*. Routledge.
2. O. H. K. (2004) *India and Pakistan*, Munshiram Mohoanlal Publications Pvt. Ltd., UK.
3. Hussain, F., & Durrani, M. J. (2009). Seasonal availability, palatability and animal preferences of forage plants in Harboi arid range land, Kalat, Pakistan. *Pakistan Journal of Botany (Pakistan)*.
4. F. A. Shams. (2004) *Land of Pakistan*, Kitabistan Publishing Company, Lahore
5. Qureshi Mr, A., Qureshi, S., Qureshi, A. (2018). *Geography of Pakistan: For Foreign Students*. (n.p.): CreateSpace Independent Publishing Platform.
6. QURESHI, I., CHAUDHARY, R., QURESHI, S. (2019). *Geography of Pakistan for Foreign Students: In Lieu of Urdu Compulsory ,for Foreign Students*. (n.p.): Independently Published.
7. Graham, I. (2009). *Pakistan*. United States: Sea-to-Sea Publications.
8. Khan, F. K., (2016). *Pakistan Geography, Economy & People*. Oxford University Press, Karachi Spate.

9. Khan, F. K. (2002) *Geography of Pakistan*, Oxford University Press, Karachi Spate,
10. Blashfield, J. F. (2012). Pakistan. United Kingdom: Raintree.

<b>GEO-510</b>	<b>Cartography</b>	<b>3(1-2)</b>
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Evolution of Cartography, Basic geodesy, spherical, ellipsoidal and geoidal earth, geographical and planer coordinates properties of the graticule and geodetic position. Map projections: Major types, merits and demerits of commonly used map projections. Map Datum, Symbolization, symbol types and graphic variables, the symbolization problems, symbolizing graphic features. Lettering principles. Mapping statistical surfaces: Thematic map, choropleth, dot map, isolines, area cartograms. Principles of cartographic design, general design problems; design of map symbols. Basic procedure and designing of the thematic maps such as topographic, climatic, economic, population, settlements, urban morphology etc. Map production, form of map output, construction material, output options, composing separations, proofing. Introduction to Digital Cartography, Terrain data (Digital Elevation Model/ Digital Terrain Model)

#### **Recommended Books**

1. Zeshen, W., & Müller, J. C. (2017). A knowledge based system for cartographic symbol design. In *Landmarks in Mapping* (pp. 103-116). Routledge.
2. Bale, J. (2013). *Geography in the Primary School (Routledge Revivals)*. Routledge.
3. Kraak, M. J., & Ormeling, F. J. (2013). *Cartography: visualization of spatial data*.
4. Grampton, J. W. (2010) *Mapping*, John Wiley & Sons, New York.
5. Robinson, A. et.al. (2002) *Elements of Cartography*, John Wiley, New York.
6. Lawrence (2001) *Cartographic Methods*, Methuen London.
7. The Map Reader: Theories of Mapping Practice and Cartographic Representation. (2011). Germany: Wiley.
8. Anthamatten, P. (2020). How to Make Maps: An Introduction to Theory and Practice of Cartography. United Kingdom: Taylor & Francis.
9. Slocum, T. A. (2009). Thematic Cartography and Geovisualization. United Kingdom: Pearson Prentice Hall.
10. Classics in Cartography: Reflections on Influential Articles from Cartographica. (2011). United Kingdom: Wiley.

<b>GEO-512</b>	<b>Climate Change Studies</b>	<b>3(3-0)</b>
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Review of general climatology: Climatic elements, World climate classification, Climate of Asia, Climate of the sub-continent, The Earth's atmosphere and surface radioactive transfers (energy balance) and Green House Effect, Ocean Circulations (Energy transport from equator to poles), Hydrological Cycle, Global Warming, Climate Change and climate variability, Natural & Anthropogenic, causes of Climate Change Climatological statistics Mean, mode, median, anomalies and trends, Introduction to time series analysis, Climate change assessment, Basic concepts of climate modeling, Impact of climate change on water, agriculture & weather pattern; Practical: To be decided by the instructor/Institute

### Recommended Books

1. Joseph Romm (2015): *Climate Change: What everybody needs to know*, Oxford University Press.
2. Mark Maslin (2014): *Climate Change: A very short introduction*, Oxford University Press.
3. Murry L. Salby (2012): *Physics of the Atmosphere and Climate*,
4. J. David Neelin (2010): *Climate Change and Climate Modeling*. Cambridge University Press
5. Cambridge Press, UK A. Barrie Pittok (2009): *Climate Change: The Science, Impacts and Solutions*, CSIRO Publishing
6. V. Conrad and L.W. Pollak (2008): *Methods in Climatology*, Harvard University Press.
7. John Michael Wallace, Peter Victor Hobbs (2006): *Atmospheric Science: An Introductory Survey*, Academic Press
8. C. N. Hewitt, Andrea V. Jackson (2003): *Handbook of Atmospheric Science: Principles and Applications*. Blackwell Pub
9. Bhattacharyya P. (2021). *Climate change and greenhouse gases emission*. New India Publishing Agency (NIPA). March 4 2024
10. *Biodiversity and climate change: transforming the biosphere*. (2019). . Yale University Press. March 4 2024

GEO-601	Digital Cartography	3(2-1)
Introduction to digital cartography, Overview of Elements of cartographic design, Typography and Lettering the Map, Maplex Label Engine, Symbolization and visualization (Color use guidelines), Arcscan and 3D Analyst: Viewing DEM (SRTM) data in 3D, Classic Cartography, Techniques, Data for Digital Cartography, Georeferencing, digitization and data base, Advance of Thematic Mapping, Choropleth Mapping, Proportional Symbol		

Mapping, Dot Density Map, sarithmetic Maps (Spatial Analyst), Pie Diagram, Raster Data and Supervised Classification, Proximity Analysis: Buffering, Mapping Flow Data: Airline Traffic, Digital Cartography and Satellite Data, Satellite Data Downloading, Tracking Analyst, analyzing hurricanes using Tracking Analyst, Cartographic Design: Special Topics, Distributed GIS, internet mapping for education, Commercial web mapping programs, Internet mapping.

Lab: Exercise related to: Maplex Label Engine, ArcScan and 3D Analyst: Viewing DEM (SRTM) Data in 3D, Data for Digital Cartography Georeferencing, Digitization and Database Development Advances in Thematic Mapping, Choropleth Mapping, Proportional Symbol Mapping, Dot Density Map, Isarithmic Maps (Spatial Analyst) Pie Diagram Graduated Symbols Raster Data and Supervised Classification Proximity Analysis: Buffering, Mapping Flow Data: Airline Traffic Digital Cartography and Satellite Data, Tracking Analyst Web mapping.

#### **Recommended Books:**

1. Slocum, T. A., McMaster, R. B., Kessler, F. C., Howard, H. (2022). Thematic Cartography and Geovisualization, Fourth Edition. United States: CRC Press.
2. Cauvin, C., Escobar, F., Serradj, A. (2013). Thematic Cartography, Cartography and the Impact of the Quantitative Revolution. Germany: Wiley.
3. Jones, C. B. (2014). Geographical Information Systems and Computer Cartography. United Kingdom: Taylor & Francis.
4. Plantin, J. (2014). Participatory Mapping: New Data, New Cartography. Germany: Wiley.
5. Chiang, Y., Duan, W., Leyk, S., Uhl, J. H., Knoblock, C. A. (2019). Using Historical Maps in Scientific Studies: Applications, Challenges, and Best Practices. Switzerland: Springer International Publishing.
6. Tang, Winnie, Jan and Selwood. (2003). Connecting Our World. Redlands, CA: ESR I Press: Redlands.
7. Peng, Zhong-Ren, Ming-Hsiang and Tsou. (2003). Internet GIS: Distributed Geographic Information Services for the Internet and Wireless Networks. Hoboken, NJ: John Wiley & Sons: New York
8. H. Wood, C. Peter and Keller, Cartographic Design: Theoretical and Practical Perspectives, John Wiley & Sons: New York.
9. Geographic Information Systems: The Microcomputer and Modern Cartography. (2013). United Kingdom: Elsevier Science.

10. Peterson, G. N. (2020). GIS Cartography: A Guide to Effective Map Design, Third Edition. United States: CRC Press.

<b>GEO-603</b>	<b>Regional Study of Asia</b>	<b>3(3-0)</b>
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Introductory course to the Geography of Central Asia, Western Asia, Southern Asia, Southeastern Asia, Eastern Asia and Asian Part: Geopolitics importance, international Relations, Physical Geography, including Climate and River systems, Population, Agriculture and Food, Energy and Manufacturing, Cities, economic realms and Environmental Issues.

**Suggested Books:**

1. Geography of Asia. (2012). United States: HardPress.
2. Tirtha, R. (2001). Geography of Asia. India: Rawat.
3. The Changing Geography of Asia. (2002). United Kingdom: Taylor & Francis.
4. Hobbs, J. J. (2021). *World regional geography*. Cengage Learning.
5. Jelen, I., Angelija, B., & Francesco, C. (2020). Geography of Central Asia. Springer International Publishing.
- Mahnken, T. G., & Blumenthal, D. (Eds.). (2020). *Strategy in Asia: The Past, Present, and Future of Regional Security*. Stanford University Press.
6. Baker, K. M., & Chapman, G. P. (Eds.). (2002). *The Changing Geography of Asia*. Routledge.
7. Fouberg, E. H., & Moseley, W. G. (2017). *Understanding world regional geography*. John Wiley & Sons.
8. Boniface, B., Cooper, C., & Cooper, R. (2016). *Worldwide destinations: The geography of travel and tourism*. Routledge.
9. Fu, C., Freney, J. R., & Stewart, J. W. (Eds.). (2008). *Changes in the human-monsoon system of East Asia in the context of global change* (Vol. 1). World Scientific.
10. ESCAP, U. (2007). Agricultural trade: planting the seeds of regional liberalization in Asia.
11. *Asia*. (2019). . Cody Koala Pop! a division of ABDO. March 12 2024

<b>GEO-603</b>	<b>Regional Study of North America</b>	<b>3(3-0)</b>
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Introductory course to the Geography of North America: Geopolitics importance, international Relations, Physical Geography, including Climate and River systems, Population, Agriculture and Food, Energy and Manufacturing, Cities, economic realms and Environmental Issues.

**Suggested Books:**

1. Hobbs, J. J. (2021). *World regional geography*. Cengage Learning.

2. Fouberg, E. H., & Moseley, W. G. (2017). *Understanding world regional geography*. John Wiley & Sons.
3. Boniface, B., Cooper, C., & Cooper, R. (2016). *Worldwide destinations: The geography of travel and tourism*. Routledge.
4. *North america*. (2021). . Focus Readers. March 12 2024
5. *North america*. (2019). . Cody Koala an imprint of Pop! March 12 2024
6. *North america*. (2019). . Rourke Educational Media. March 12 2024
7. Lesley J. (2023). *North america*. Redback Publishing.
8. *North america*. (2023). . Crabtree Publishing Company. March 12 2024
9. *North america*. (2023). . Franklin Watts.
10. *North america*. (2024). . Bearport Publishing Company. March 12 2024

<b>GEO-605</b>	<b>Soil Geography</b>	<b>3(3-0)</b>
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Nature and scope of soil geography, Soil geography, Pedology / Soil Science and Edaphology, Significance of Soil Geography, Factors and processes of soil formation and development, Factors of Soil Formation, Parent Material, Climate, Relief/topography, Organisms/biological activity, Time, Pedogenic /Soil Farming Processes, Soil addition, Soil depletions, Translocations, Transformations, Chemical properties of soil, Chemical composition of soil, Soil acidity and soil alkalinity, Classification of soil on the basis of acidity and alkalinity, Colloids and Cation exchange, Basic physical properties of soil, Soil porosity, water percolation and circulation, Physical composition of soils, Organic content, Inorganic content, Water/moisture/humidity, Air, Soil Texture, Particle Size Analysis, Soil Textural Classes, Soil structure, Importance of Structure, Managing Soil Structure, Soil profiles/Reading the soil, Introduction to soil profile, Soil Color, Determination of Soil Color, Factors Affecting Soil Color, Significance of Soil Color, Soil Temperature, Heat Balance of Soils, Location and Temperature, Control of Soil Temperature, Permafrost, Soil Classification, Soil taxonomy and soil order; genetic classification of soils, World distribution and characteristics of soils, Classification and characteristics of soils in Pakistan, Soil management, Problems of soils in Pakistan, Water logging and salinity, Soil degradation, desertification, Soil erosion (concepts, causes and effects), Human interaction with soils, Concept of soil management, Need of soil management, Methods of soil management, Field visit, practical and lab work, Field visit to various geographical sites, Collection of soil samples and their management, Soil pH analysis using pH meter, Soil texture and particle size analysis using sieve method, Soil color identification using Mansell color system,

### **Recommended Books**

1. Backman, H.O and Brady, N.C ( 1960) *The Nature and Properties of Soils*, Mc Millan NewYork
2. Bunting, B.T. (1973) *The Geography of Soils*, Hutchinson, London
3. Clarke G.R. (1957) *Study of the Soil in the Field*, Oxford University Press, Oxford
4. Foth H.D. and Turk, L.M.(1972) *Fundamentals of Soil science*, John Wiley, New York
5. Govinda Rajan, S.V. and Gopala Rao, H.G.(1978) *Studies on Soils of India* Vikas, New Delhi
6. Mc. Bride, M.B. (1999) *Environmental Chemistry of Soils*, Oxford University Press, New York
7. Melesse, A & Abteu, W (2016) *Landscape Dynamics, Soils and Hydrological Processes in Varied Climates*. Springer International Publishing.
8. Nye, P.H. and Greene, D.J. (1960) *The Soil under Shifting Cultivation Commonwealth Bureau of Soil Science, Technical Communication, No. 51; Harpender, England*
9. Osman, K. T (2018) *Management of Soil Problems*. Springer International Publishing.
10. Raychoudhuri, S.P. (1958) *Soils of India*, ICAR, New Delhi
11. Russell, Sir Edward J. (1961) *Soil Conditions and Plant Growth*, Wiley, New York

**GEO-607****Population Geography****3(3-0)**

Nature and Scope of Population Geography, World Distribution of Population: Diversity of distribution, Factors influencing population distribution, physical, cultural, technological, temporal and political factors; Distribution of population: Resource regions of population in the world, Measures of Population Distribution, Advantages and disadvantages of arithmetic density, Physiological and economic densities of population, Measures of centrality tendency of population distribution, Measures of population dispersion and potential; Population Composition: Urban and rural characteristics, Biological characteristic, Cultural characteristics; Components of Population Growth: Patterns and trends of fertility, patterns and consequences of population mortality, Causes and consequences of migration; Problems of Population Data: Sources of Population data, Methods of census, vital registration and sample surveys, Major errors and omissions in population data; Population Analysis: Analysis of fertility, Analysis of mortality, Analysis of migration.

**Recommended Books:**

1. Video Education Australasia. (2012). *Population geography*. Bendigo, Vic: VEA distributor.
2. Singh, I. (2006). *Population geography*. New Delhi: Alfa Publications.
3. Yadav, J. P., & Institute for Sustainable Development. (2004). *Population geography*. Lucknow India: Institute for Sustainable Development.
4. Pacione, M. (2011). *Population Geography*. New York: Routledge.

5. Chakraworthy, K. (2006). *Population geography*. New Delhi: Mohit Publications.
6. *Population geography : a systematic exposition*. (2020). . Routledge Taylor & Francis Group. March 12 2024
7. *Population geography : tools and issues (Fourth)*. (2021). . Rowman & Littlefield. March 12 2024
8. Infobase. (20102009). *Population geography*. Retrieved March 12 2024 .
9. Valdenarro R. B. (2020). *Population geography*. Delve Publishing. March 12 2024

<b>GEO-609</b>	<b>Cultural Geography</b>	<b>3(3-0)</b>
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Definition of culture and Cultural Geography, History of cultural geography, Structure and components of culture according to Huxley Model, Processes of culture ,Major Cultural hearths, Themes in Cultural Geography, Geographies of Cultural Differences, Culture History, Geography of Language, Geography of Religion, Religion and conflict: The question of the clash of civilizations, Religious fundamentalism, Geography of Gender, Ethnic Geography , Cultural Landscape , Applying cultural geography: A case study approach, Common themes in case, Writing a report on a cultural study or making a documentary.

#### **Recommended Books**

1. Haggett, P. (1983) *Geography: A Modern Synthesis*. Harper and Row Publishing co. Cambridge
2. Fellmann & Getis (2003) *Human Geography: Landscape of human activities*. John Wiley & Sons, New York.
3. De Blij, H. (2007). *Geography: Realms, Regions and Concepts (9<sup>th</sup> Ed)*. John Wiley & Sons, New York
4. De Blij, H. & Murphy, A. (2003). *Human Geography: Culture, Society and Space*. John Wiley & Sons Inc., New York.
5. Jordan,T.; Domosh, M.; Neumann, R.; Price, P. (2009) *The Human Mosaic*. W.H. Freeman & Co. New York
6. Crang M. (1998). *Cultural geography*. Routledge.

<b>GEO-611</b>	<b>Transportation Geography</b>	<b>3(3-0)</b>
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Basic Concepts of Transportation Geography, Definition, Growth and scope of transportation Geography, Theory of transportation, Spatial variations in transport costs, Lactation of transport routes and networks, The structure of transportation costs, Transportation costs and the location of economic activity, Transportation improvements and their spatial impact;

Transportation network analysis: Measurement of nodal accessibility, Nodal accessibility, The shortest path matrix, Network as valued graph, Graph theory, interpretation of hierarchies, Linkage importance in a regional highway network, Design and performance of network, Costs and benefits in path design, Traveling salesman, problem, Other minimum distances, The best path in network; Flow analysis: Concepts and models in flow analysis, Gravity model, Basic gravity model, Gravity model and traffic gravity model and hinterland analysis, Gravity model and potential maps, Jilman's trade, Weakness of the gravity model: Model systems: Characteristics and comparison of the following models, Rail road, Motor transport, Water ways, Air transportation, Pipe lines; Transportation planning in developing countries, The need for comprehensive planning and analysis, System approach, Comprehensive planning, Pricing policies, Transport alternatives evaluation models, Regional consumption, incomes, prices, Aggregate demand, production and growth, Input-output relationship, Investment and capacity, Transportation sector.

### **Recommended Books**

1. *An introduction to transportation geography: transport mobility and place.* (2021). . Rowman & Littlefield.
2. *An introduction to transportation geography: transport mobility and place.* (2021). . Rowman & Littlefield.
3. *The governance of smart transportation systems : towards new organizational structures for the development of shared automated electric and integrated mobility.* (2019). . Springer. March 12 2024
4. Jin F. Wang C. Cao Y. Cao X. Wang J. Dai T. & Jiao J. (2016). Progress of research on transportation geography in china. *Journal of Geographical Sciences* 1067–1080. <https://doi.org/10.1007/s11442-016-1316-x>
5. Nilsson I. (2023). Transportation geography specialty group report 2023. *Journal of Transport Geography*. <https://doi.org/10.1016/j.jtrangeo.2023.103628>
6. Singh, M. (2011). *Transport geography*. Jaipur: ABD Publishers.
7. Sharma, S. P. (2010). *The geography of transport systems*. Delhi: Vista International Pub. House.

<b>GE0-613</b>	<b>Geography of Recreation &amp; Tourism</b>	<b>3(3-0)</b>
Definition and concept of recreation and tourism, History of recreation and tourism, Scope of recreation and tourism, Relation of recreation and tourism with other disciplines, Advantages of Recreation and Tourism, Determinants of Recreation and Tourism, Climate and Tourism,		

Transport a basic Facility for tourism, Pattern of tourism, Cultural and Economic impact of Tourism, Tourism in Pakistan.

### **Recommended Books**

1. Pröbstl, U., Bell, S., Elands, B. H. M., & Wirth, V. (2010). *Management of Recreation and Nature Based Tourism in European Forests*. (Management of recreation and nature based tourism in european forests.) Berlin, Heidelberg: Springer-Verlag Berlin Heidelberg.
2. Hall, C. M., & Page, S. J. (2014). *The geography of tourism and recreation: Environment, place and space*. London: Routledge.
3. Tamagno, B., & Geography Teachers' Association of Victoria. (1985). *A Geography of recreation*. Richmond, Vic: Heinemann Educational Australia in association with the Geography Teachers' Association of Victoria.
4. *The geography of recreation and leisure*. (2016). . Routledge. March 12 2024
5. *An historical geography of tourism in victoria australia : case studies*. (2014). . De Gruyter Open. March 12 2024
6. *The geography of tourism and recreation : environment place and space (Fouth)*. (2014). . Routledge. March 12 2024
7. Sharp J. (2018). *The geography of tourism and recreation*. Trittech Digital Media. March 12 2024
8. *The routledge handbook of nature based tourism development*. (2023). . Routledge. March 12 2024

<b>GE0-615</b>	<b>Geography of Arid Lands</b>	<b>3(3-0)</b>
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Introduction and Scope of Arid Land Geography: Introduction to Aridity, Types of Aridity Natural causes and anthropogenic drivers of aridity, Levels of Aridity, Climate of Arid, Regions, Patterns of rainfall in arid and semi-arid areas, Pressure gradient and winds in the arid regions, Humidity and temperature, Geomorphic processes in the arid areas, Agents of landform creation and alteration in arid lands, Macro Scale Winds, Meso/Micro Scale Winds: (Local Winds), Fluvial/Water Processes, Rivers of Deserts, Exogenous Rivers, Endoergic Rivers, Ephemeral Rivers; Aeolian/Wind Processes, Landforms made by Wind, Erosional Landforms of Wind, Depositional Landforms of Wind; Landforms made by Water; Erosional Landforms of Water, Depositional Landform of Water; Life in the arid lands, Settlement Pattern in Arid Land: Irrigation Pattern in Arid Land, Mode of Cultivation in Arid Land, Agricultural Potential in Arid Land , Arid Zone Carrying Capacity and Pastoralism, Arid Land and Livestock, Wild Life in Arid Land; Water Resources in Arid Land, Availability of

fresh water in the arid regions, Use of Water Resources, Decline of Water Resources, Sustainable Management of Water Resources, Soil of Arid Land, Characteristics of arid soil, Soil Degradation, Methods of controlling the Soil Degradation Desertification, Definition, Causes of Desertification; Aridity as the main cause of desertification and land degradation, Types of Deserts, Distribution of Deserts, Monitoring, and Control of Desertification; World Major Deserts.

**Recommended Books:**

1. Evans, D. J. A., &Goudie, A. S. (Eds.). (2004). *Arid Land Geomorphology*. New York: Routledge.
2. Khandelwal, B. L. (1999). *Arid Ecology*. Painter Publishers, Jodh Pur.
3. Babaev,A.G(1996). *Problems of Arid land Development*, Moscow University Press.
4. Andrew S.Goudie (1990). *Techniques for Desert Reclamation*. John Wiley & Sons New York.
5. Sharma,M. I. (1986).*Geomorphology of Semi-Arid Regions*, Scientific Publishers, Jodhpur, India.
6. Cook,R.U and A, Warren. (1973). *Geomorphology in Deserts*. University of California Press,Berkeley, California, USA.
7. Durrenberger, R. W. (1987) 'Arid Climates', article in *The Encyclopedia of Climatology*, p. 92-101, Edited by J. E. Oliver and R. W. Fairbridge, Van Nostrand Reinhold Company, New York.
8. Stadler, S. J (1987) 'Aridity Indexes', article in *The Encyclopedia of Climatology*, p. 102-107, Edited by J. E. Oliver and R. W. Fairbridge, Van Nostrand Reinhold Company, New York.
9. *Reclamation of arid lands*. (2018). . Springer. March 12 2024

<b>GE0-617</b>	<b>Geography of Settlement</b>	<b>3(3-0)</b>
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Introduction, Significance of settlement geography, basic definitions: Site and situation, hierarchy and types of settlements, Rural settlements: Dispersed settlements, nucleated and ribbon settlements; their contrasts between More Developed Countries (MDCs) and Less Developed Countries (LDCs), Forms and patterns of settlements, house types and their evolution in rural areas, Commercial functions of rural settlements and their role as a market town, Infrastructure and services in rural settlements. Historical evolution of urban settlements, western and non-western urbanization, rural-urban fringe, suburbs and satellites, Economic base, urban function and functional classification, Towns and villages as central places, Internal structure of the cities and land use pattern, Theories of urban structure:

Concentric Zone theory, Sector theory, Multiple Nuclei theory, and social area analysis, Urban development: slums and blighted areas. City-size, distribution, rank-size rule, primate city Lab. Work: Analysis of settlement types from topographic sheets, their centrality as population foci, urban areas etc.

Field Visit: Field trips to study land use of major cities in Pakistan.

**Recommended Books:**

1. Gottdiener, M. & Budd, L. (2005) Key concepts in Urban Studies. SAGE Publications, London.
2. Gupta, K. R. (2004) Urban Development debates in the new Millennium, Vol.4, Atlantic Publishers, New Delhi.
3. Hall, T. & Barrett, H. (2012) Urban Geography, Routledge, Taylor & Francis Group, London.
4. Hudson, F. S. (1970) Geography of Settlement. Macdonald & Evans, London.
5. Knapp, B. (1986) Systematic Geography, Allen & Unwin, London.
6. Larice, M. (Ed.) (2013) The Urban Design Reader, Routledge, Taylor & Francis Group, London.
7. LeGates, R.T. (Ed.) (2011) The city Reader, Routledge Taylor and Francis Group, London.
8. Lewis, C. P., Mitchel, F. & Dyer, C. (2001) Village, Hamlet and Field: Changing Medieval Settlements in Central England. Windgather Press, England.
9. Macionis, J. J. & Parrillo, V. N. (2011) Cities and Urban life, PHI learning, New Delhi.
10. Michael, P. (2002) Urban Geography. A global prospective, Rutledge,
11. New York. Murphy, R. E. (1966) The American City: An Urban Geography. McGraw Hill, New York.
12. Neuwirth, R. (2004) Shadow Cities: A Billion Squatters, A New Urban World, Rutledge, New York.

<b>GE0-619</b>	<b>Urban Ecology</b>	<b>3(3-0)</b>
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Urban ecology: Humans as components of urban ecosystems, Global urbanization patterns (past, present, future) and recent trends in Pakistan. Populations and community diversity in the urban environment, Urbanization effects on environmental health, Functions in urban ecosystem: growth, productivity, disease, exotic species and invasive species in urban areas. Landscape signature and urban heat-island effect, Ecological design and sustainable cities, Concept of urban green spaces for people and biodiversity, Urban inequalities and slum area characteristics, Urban health and emerging diseases, Urban land use planning and management in Pakistan.

Recommended Books:

1. Urban Ecology. Cambridge University Press, Cambridge. Gaston, K.J. (ed.) 2010.
2. Applied Urban Ecology. Wiley-Blackwell, UK. Richter M and U. Weiland (ed.) 2012.
3. Land-Use Planning for Sustainable Development, Silberstein, J. and Maser, C., CRC Press LLC. USA, 2000
4. Gaston K. J. (2010). *Urban ecology*. Cambridge University Press. March 12 2024
5. Urban Ecology Australia. (n.d.). Urban Ecology Australia : caring for the Earth caring for people living creatively together. <http://www.urbanecology.org.au>
6. *Science for the sustainable city : empirical insights from the baltimore school of urban ecology*. (2019). . Yale University Press. March 12 2024
7. *Urban ecology : emerging patterns and social-ecological systems*. (2020). . Elsevier. March 12 2024

<b>GE0-621</b>	<b>Natural Resources Management</b>	<b>3(2-1)</b>
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Natural resources: classification of natural resources, resource degradation, carrying capacity, ecological footprints, sustainable management of natural resources, different approaches to natural resource management, conservation, preservation, Community based natural resource management, Development of natural resource management, Forest management: forest types and its existing management, watershed management, wetland management, rangeland management, livestock management, wildlife management, Agriculture resource management, Energy (coal, hydrocarbon, hydel) and Mineral Resource (Metallic and non-metallic deposits) Management, Land use Planning and Management, Water Resource Management, Flood control, drought management, groundwater concepts and skimming wells. Fisheries Management.

Lab Work: Identification of different types of Soil, vegetation, land cover and land use, shoreline erosion, saltwater marsh migration, forestry areas, desertification, watershed, natural hazard, on satellite images and monitoring of environment, environmental change, natural resources management, natural hazard assessment.

#### **Recommended Books:**

1. Environmental Science: working with Earth. 2013. Miller, T.G. 9th Edition. Jack Cary Publisher London.
2. Basics of forestry and Applied Sciences, Concepts and Theory. Masood A.A Qureshi, 3rd Ed Vol-1, A-one Publishers 2005.

3. Environment: Problems and Solutions. Asthana, D. K & Asthana, M, 5th Ed, S. Chand & company LTD 2006.
4. Environmental Science: Earth as Living Planet. Botkin, D., & Keller, E, 8th Ed. John Wiley and Sons 2000. Environmental Science: working with Earth. Miller. T. G, 9th Edition, Jack Cary publisher 2003.
5. *Natural resources : management economic development and protection*. (2009). . Nova Science Publishers. March 4 2024
6. *Natural resources management and biological sciences*. (2021). . IntechOpen. March 12 2024
7. Knight R. L. & White C. (2009). *Conservation for a new generation : redefining natural resources management*. Island Press. March 12 2024

<b>GE0-623</b>	<b>Hydro Geography</b>	<b>3(3-0)</b>
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Hydro Geography: Introduction, scope and aim, types of water bodies, The hydrological cycle: global hydrological cycle, fluxes, reservoirs, and residence times, evaporation, condensation, precipitation, regional water balances and resources, hydrological effects of climate change, Hydrological processes: precipitation, infiltration, evaporation, groundwater and runoff: Theory for runoff generation, Water in saturated and unsaturated zone. Snow hydrology: Ice on lakes and in rivers. Measurement and calculation of hydrological processes: Numerical models. Floods, Urban hydrology, Hydrological prognosis, Principles of fluid dynamics, Catchment hydrology: Streams, floods and droughts, Managing water resources: Towards a sustainable future?

**Recommended books:**

1. Brutsaert, W. (2023). *Hydrology*. Cambridge university press.
2. Ward, A. D., & Trimble, S. W. (2003). *Environmental hydrology*. Crc Press.
3. Bierkens, M. F. (2015). Global hydrology 2015: State, trends, and directions. *Water Resources Research*, 51(7), 4923-4947.
4. More, R. J. (2013). Hydrological models and geography. In *Physical and Information Models in Geography (Routledge Revivals)* (pp. 145-185). Routledge.
5. Haruyama S. & Lê V. H. (2010). *Hydro gis : theory and lessons from the vietnamese delta*. Nova Science.
6. *Hydrology in a changing world : challenges in modeling*. (2019). . Springer. March 4 2024
7. *Methodological approaches in physical geography*. (2022). . Springer. March 4 2024
8. *Fundamentals of hydrology (Third)*. (2019). . Routledge Taylor & Francis Group.

9. Water earth and man: a synthesis of hydrology geomorphology and socio-economic geography (1st ed.). (2021). . Routledge. March 4 2024
10. *Hydrology and global environmental change*. (2014). . Routledge. March 4 2024

<b>GEO-625</b>	<b>Urban Geography</b>	<b>3(3-0)</b>
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Introduction and orientation of Urban Geography from global to local, Urban Structure, Urban Geography Theories and urbanization factors, Models of Urban Geography, the process of urbanization, the process of city growth, an overview of an urbanizing world, Urban structure and land use in the western city, Living in the city: Economy, Society and Politics in the western city, Urban Geography in the Third world, In the city: economy, society and politics in the western cities.

### Recommended Books

1. Hall T. & Barrett H. L. (2011). *Urban geography* (4th ed.). Routledge.
2. *Urban geography* (Third). (2014). . Wiley.
3. Abler, R.F., Marcus, M.G. and Olson, J.M. (1992). *Geography's Inner Worlds: Pervasive Themes in Contemporary American Geography*. New Brunswick, N.J. Rutgers University Press.
4. Brown, L.A., and Moore. E.G. (1971). The intra-urban migration process: A perspective. Pp. 200-209 in *Internal Structure of the City*, L.S. Bourne (ed.). Toronto: Oxford University Press.
5. Pacione, M., (2005). *Urban Geography: A Global Perspective*, Taylor & Francis Group London and New York
6. Wheeler, S.M., Beatley, T. (2004). *The Sustainable Urban Development Reader*. New York, Routledge
7. *Handbook of urban geography*. (2019). . Edward Elgar Publishing. March 4 2024
8. Archaeopress. (2016). *An urban geography of the roman world 100 bc to ad 300*. March 4 2024
9. *Sir peter hall: pioneer in regional planning transport and urban geography*. (2016). . Springer. March 4 2024
10. *Urban geography*. (2018). . Routledge. March 4 2024

<b>GEO-627</b>	<b>Environmental Geography</b>	<b>3(3-0)</b>
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Introduction, Evolution of Environmental Studies in Geography, Comparative Advantage of Geography, Concept of environmental management, Environment and Man,

Ecosystem o Resources o Important Cycles o Population explosion o The human impact on the environment, Environmental hazards, Types of Hazards, Geophysical Quasi-Natural, Biological, Technological, Human Response Parameters, Risk assessment and perception, Adjustment to Hazards, Major Environmental hazards and Problems in Pakistan: Floods, Earthquake; Tsunami Cyclones, Landslides, Droughts, Deforestation and Desertification, Water-logging and Salinity, Soil Erosion, Global Warming and ozone depletion, Environmental Pollution, Waste Management, Control and Mitigation Measures, Technology, Awareness, Legislation Ethics Pakistan Environmental Act National Conservation Strategy National Environmental Quality Standards

Recommended Books:

1. Singh M. (2011). *Environmental geography*. ABD. March 12 2024
2. Environmental geography : people and the environment (First). (2018). . ABC-CLIO an imprint of ABC-CLIO LLC. March 12 2024
3. Castree N. (2009). *A companion to environmental geography*. Wiley-Blackwell. March 12 2024
4. Coith D. (2019). *Environmental geography ecology biodiversity and climate change*. Amiga Press. March 12 2024
5. Khan M. Z. A. & Agarwal S. K. (2004). *Environmental geography*. APH Pub. Corp.
6. Cengage Learning (Firm) & National Geographic Learning (Firm). (2019). *Environmental science* (Sixteenth). National Geographic Learning/Cengage.
7. Dauray J. (2013). *Environmental science*. Alpha a member of Penguin Group (USA).
8. Brooks W. R. & BarCharts Inc. (2010). *Environmental science*. BarCharts. March 12 2024

<b>GEO-602</b>	<b>Land use planning</b>	<b>3(3-0)</b>
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Land use planning concepts, Approaches, Scope and significance, Tools and techniques in land use planning, Conceptual Framework, Types of land use Zoning, Functional, Form based, Intensity, Incentives zoning, elements of Comprehensive land use plan; Introduction, background and Concepts of Smart Growth, types of Land use Plan, steps in Land use Planning Process, Plan Preparation, Stakeholder engagement, Inception Report, Situation analysis Report (SAR), Proposal Formulation, Approval and Finalization, Policy Implementation, preparation of Term of references (TOR), element of Comprehensive Master plan, Summary of Institutional Framework for land use Planning Process, The Land Use Planning Arena, Concepts of Land Use Change Management. A Local Government Land Use

Planning Program, Application of GIS in land use Planning, Land use suitability, Land use Planning examples from modern world, Land use Planning in Urban world, Land use planning in Pakistan, Land use Planning in sustainable development

### Recommended Books

1. *Contemporary issues in land use planning*. (2023). . IntechOpen. March 4 2024
2. Cao X. Ding C. & Yang J. (2022). *Urban transport and land use planning : a synthesis of global knowledge*. Academic Press. March 4 2024
3. Priemus H. Button K. & Nijkamp P. (2007). *Land use planning*. Edward Elgar.
4. *Human-environmental interactions in cities : challenges and opportunities of urban land use planning and green infrastructure*. (2014). Cambridge Scholars Publishing. March 4 2024
5. *Comparative urban land use planning : best practice*. (2017). Sydney University Press. March 4 2024
6. International Conference on Soil Classification and Reclamation of Degraded Lands in Arid Environments Shahid S. A. Taha F. K. & Abdelfattah M. A. (2013). *Developments in soil classification land use planning and policy implications : innovative thinking of soil inventory for land use planning and management of land resources*. Springer. March 4 2024
7. Silberstein, J., & Maser, C. (2013). *Land-use planning for sustainable development*. CRC Press.
8. Metternicht, G. (2018). *Land use and spatial planning: Enabling sustainable management of land resources*. Springer.
9. Deakin, E. (2019). *Transportation, land use, and environmental planning*. Elsevier.
10. Needham, B. (2016). *Dutch land-use planning: The principles and the practice*. Routledge.

<b>GEO-604</b>	<b>Oceanography</b>	<b>3(3-0)</b>
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Introduction to the Oceanography, Physical Oceanography and Marine Biology, Scope of the Oceanography, Oceans of the world, Oceans Bottom Relief, continental shelf, Continental slope, Continental rise, Abyssal plains, depths and trenches, Temperatures of the oceans: Horizontal distribution of the temperatures, Vertical distribution of the temperatures, Factors effecting on the temperature, Oceanic Salinity, Ocean Deposits: Ocean deposit classification on the basis of origin, Terrigenous deposits, Submarine volcanic deposits, Organic deposits, Inorganic deposits: Deposit classification on The basis of location, Terrigenous deposits, Pelagic deposits, Neritic deposits, Coral reef and density of oceanic water; Oceanic Movements: Oceanic Currents: World oceanic currents distribution, Factors effecting oceanic currents distribution, Wind system and Oceanic currents: Wind system and distribution of oceanic currents, Major oceanic trade routes and role of wind system and oceanic currents.

### Recommended Books

1. Garrison, T. and Allis, R (2013). *Oceanography: An Invitation to Marine Science, National Geographic Learning and Cengage Learning*
2. Hess, D., Tasa, D.G. (2017). *McKnight's Physical Geography: A Landscape Appreciation, Pearson*
3. Strahler, A. H. and Strahler, A (2006) *Introducing Physical Geography, John Wiley and Sons*
4. Trujillo, A.P. and Thurman, H.V. (2017) *Essentials of Oceanography, Pearson*
5. *Introduction to Physical Oceanography: Third Edition. (2016). (n.p.): Waveland Press.*
6. Pickard, G. L., Emery, W. J. (2013). *Descriptive Physical Oceanography: An Introduction. United Kingdom: Elsevier Science.*
7. Cundy, D. A., Cundy, A., Kershaw, S. (2013). *Oceanography: an Earth Science Perspective. United Kingdom: Taylor & Francis.*
8. *Oceanography: The Present and Future. (2012). United States: Springer New York.*
9. Bharatdwaj, K. (2006). *Physical Geography: Oceanography. India: Discovery Publishing House Pvt. Limited.*
10. Thomas, D. N., Bowers, D. G. (2021). *Introducing Oceanography. United Kingdom: Dunedin Academic Press.*

<b>GEO-606</b>	<b>Urban Planning</b>	<b>3(2-1)</b>
<p>Nature of urban Geography: , History of Planning in world especially in developed countries, The Concept and Need of Urban Planning, Philosophical approaches, Overview of Urban Development, Growth and Transition in an Urban System, City-Wide Process, Urbanization and Urban Environment, The Urban Structure and System, analysis and models for urban planning, Modern Urban Planning Movements, Components of Urban Planning, Urban Planning Models and their functions, legal basis for planning and comprehensive plan, Scenario modeling for urban development, Transportation Planning, Route optimization and analysis, Traffic flow modeling, environmental factors in urban planning, Impact assessment, Green space planning, community participation in urban planning, water supply and sewage systems, Smart city initiatives, Real-world Applications and Future Trends, Future Prospects of Urban Planning</p>		
<p>Lab Work: City Tour and Urban spatial Analysis, Report for urban planning; predicting population growth, zoning, Geospatial Mapping and analysis for urban planning, analyzing park space, surveying the water supply, identifying transportation patterns, recognizing food</p>		

supply demands, allocating healthcare and social services, land use. Survey of any area to plan an empty or already planned region.

### Recommended Books:

1. Hall, T., & Barrett, H. (2012). *Urban geography*. Routledge.
2. Lake, R. W. (1992). Planning and applied geography. *Progress in human geography*, 16(3), 414-421.
3. *Global trends of smart cities : a comparative analysis of geography city size governance and urban planning*. (2021). . Academic Press. March 4 2024
4. *Gis in sustainable urban planning and management*. (2019). . CRC Press. March 4 2024
5. *Project risks : actions around uncertainty in urban planning and infrastructure development*. (2019). . ISTE Ltd. ; Wiley. March 4 2024
6. *Routledge handbook of urban planning in africa*. (2020). . Routledge. March 4 2024
7. Douay N. & Minja M. (2021). *Urban planning for transitions*. John Wiley & Sons Incorporated. March 4 2024
8. *Narrative in urban planning : a practical field guide*. (2023). . transcript. March 4 2024
9. *Narrative in urban planning : a practical field guide*. (2023). . transcript. March 4 2024
10. *Nature-based solutions for sustainable urban planning : greening cities shaping cities*. (2022). . Springer. March 4 2024

<b>GEO-608</b>	<b>Environmental Impact Assessment</b>	<b>3(3-0)</b>
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Introduction to EIA: Purpose and aims of EIA, Nature and Scope of environmental issues and impacts, Principles of EIA administration and practice, Key elements of the EIA process, Cost and Benefit Analysis, Law policy and Institutional arrangement: About EIA Systems, EIA Policy and Legislation EIA Requirements of International Organizations, Principles for a Functional EIA System, Public Involvement: What is public involvement? Stakeholders involved, Principles of public involvement, Public Involvement Principles, Scope of involvement, Planning a public involvement programme, Arguments against and favor of public involvement ,Screening, Scoping: Impact Analysis: Mitigation Measures EIA Report:, EIA Review Process: Role and Purpose of the EIA Review Process, Decision Making: EIA as part of the Decision-making Process, Key Objectives of EIA implementation and follow up, Tools for Environmental Management and Performance Review, Monitoring, Implementation Management Planning, Environmental Auditing, Evaluation of EIA Effectiveness and Performance, Final EIA report; Practical: EIA practice by the help of a proposed project, Localization of EIA legislation, Public involvement practice by the help of a proposed project like any commercial plaza or road construction, Screening Exercise, EIA reporting practice, Mitigation of a specific project, Impact significant assessment, EIA Report Quality Assessment Exercise, Scoping in Practice EMP and audit program.

### Recommended Books

1. Mareddy, A. R. (2017). *Environmental impact assessment: Theory and practice*.
2. Yang, J., & Zhang, A. (2017). *Environmental management in mega construction projects*.
3. Yusuf, T. A. (2017). *Environmental impact assessment (EIA): Regulations and practice in Nigeria*.
4. Krishna, I. V. M., & Manickam, V. (2017). *Environmental Management: Science and Engineering for Industry*.
5. Rosales J. (2020). *Environmental impact assessment*. Delve Publishing. March 4 2024
6. *Environmental impact assessment*. (2014). . I.K. International Publishing House Pvt.
7. *Environmental impact assessment : incorporating sustainability principles*. (2021). . Palgrave Macmillan. March 4 2024
8. *Environmental impact assessment handbook : a practical guide for planners developers and communities (Third)*. (2020). . ICE Publishing. March 4 2024
9. *Environmental impact assessment by green processes*. (2022). . MDPI - Multidisciplinary Digital Publishing Institute. March 4 2024
10. *Routledge handbook of environmental impact assessment*. (2022). . Routledge Taylor & Francis Group. March 4 2024

<b>GEO-610</b>	<b>Regional Planning &amp; Development</b>	<b>3(2-1)</b>
<p>Introduction to Regional Planning and Development, Planning Principles, Practices, Planning process, Approaches of Regional Planning, Regional Resource Analysis, Planning &amp; Development, Application of GIS in Regional Planning &amp; Development, Lab work: Swot</p> <p>Analysis by the help of a familiar region, System planning and master, planning exercise by the help of a familiar region. Planning module exercise by the help of planning process application,</p> <p>Re-planning by the help of system planning concepts, Spatial planning by the help of GIS, Survey of any area to plan an empty or already planned region.</p> <p>Recommended Books</p> <ol style="list-style-type: none"> <li>1. Adams, D. (2012). <i>Urban Planning And The Development Process</i>: Taylor &amp; Francis.</li> <li>2. Blowers, A., &amp; Evans, B. (2013). <i>Town Planning into the 21st Century</i>: Taylor &amp; Francis.</li> <li>3. Chadwick, G. (2013). <i>A Systems View of Planning: Towards a Theory of the Urban and Regional Planning Process</i>: Elsevier Science.</li> <li>4. Couch, C. (2016). <i>Urban Planning: An Introduction</i>: Palgrave Macmillan.</li> <li>5. Glasson, J., &amp; Marshall, T. (2007). <i>Regional planning</i>: Routledge.</li> <li>6. Rondinelli, D. (1985). <i>Applied methods of regional planning: the urban functions in rural development approach</i>.</li> <li>7. Thakur, R. R., Dutt, A. K., Thakur, S. K., &amp; Pomeroy, G. M. (2020). <i>Urban and Regional Planning and Development</i>: Springer.</li> </ol>		

8. RAPAD. (20AD). *Rapad: remote area planning & development board*. Retrieved March 4 2024 .
9. Regional information and regional planning (Reprint 2018). (2019). . De Gruyter Mouton. March 4 2024
10. *Urban and regional planning* (Sixth). (2020). . Routledge.

<b>GEO-612</b>	<b>Advance Remote Sensing</b>	<b>3(2-1)</b>
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**Theory:** Introduction and fundamentals of Remote Sensing, Types of remote sensing systems: passive and active, electromagnetic spectrum. Remote Sensing Platforms and Sensors, Types of remote sensing sensors, Characteristics and applications of different sensors. Image Acquisition and Pre-processing: Image acquisition geometry and resolution, Radiometric and geometric corrections, Image enhancement techniques. Image Interpretation and Classification Basics: Supervised and unsupervised classification methods. Applications of Remote Sensing: Topographic mapping and digital elevation models, Cartographic applications of remote sensing. Emerging Trends and Future Directions: Hyperspectral and LiDAR technologies, Integration with GIS and other technologies, Discussion on the future of Remote Sensing.

**Practical:** Identifying features in satellite images, Exploring satellite imagery datasets, Performing basic image preprocessing steps, Conducting basic image interpretation and classification, Analyzing land cover changes using remote sensing data, Assessing water bodies and urban areas from satellite imagery, Mapping Vegetation using remote sensing data, Exploring advanced sensors and technologies.

#### **Bibliography:**

- 1.Campbell, J. B., & Wynne, R. H. (2011). *Introduction to remote sensing* (5th ed.). Guilford press.
- 2.Chuvieco, E. (2020). *Fundamentals of satellite remote sensing: An environmental approach* (3rd ed.). CRC press. <https://doi.org/https://doi.org/10.1201/9780429506482>
- 3.Jensen, J. R. (2009). *Remote sensing of the environment: An earth resource perspective 2/e*. Pearson Education India.
- 4.Lavender, S., & Lavender, A. (2023). *Practical handbook of remote sensing* (2nd ed.). CRC Press.
- 5.*Satellite remote sensing of terrestrial hydrology*. (2022). . Springer. March 4 2024
- 6.*Concepts and applications of remote sensing in forestry*. (2022). . Springer. March 4 2024

7. *Remote sensing and giscience : challenges and future directions*. (2021). . Springer. March 4 2024

8. National Research Council (U.S.). National Research Council (U.S.). Polar Research Board & National Research Council (U.S.). Division on Earth and Life Studies. (2014). *Opportunities to use remote sensing in understanding permafrost and related ecological characteristics : report of a workshop*. National Academies Press. March 4 2024

9. Chang N.-B. (2012). *Environmental remote sensing and systems analysis*. CRC Press. March 4 2024

10. *Advanced sensing in image processing and iot (First)*. (2022). . CRC Press. March 4 2024

<b>GEO-614</b>	<b>Political Geography</b>	<b>3(3-0)</b>
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Introduction: Approaches in the politico-Geography study, Concept of the State, Forces in the Internal Functioning of a State, Factors of External Relations, Geo-Politics, Foreign Relations of Major Power, International and Regional Organization, Geo-Political Study of South Asia. International Organizations : UNO , SAARC , SCO .

#### **Recommended Books**

1. Blacksell, M. (2006). *Political geography*. London: Routledge.
2. Glassner, M. I., & Fahrner, C. (2004). *Political geography*. Hoboken, NJ: Wiley.
3. Agnew, J., & Muscarà, L. (2012). *Making political geography*. Lanham, MD: Rowman & Littlefield.
4. Flint, C., & Taylor, P. J. (2018). *Political geography: World-economy, nation-state and locality*.
5. *Political geography* (English). (2021). . Peter Lang.
6. *Political geography of cities and regions : changing legitimacy and identity*. (2023). . Routledge Taylor & Francis Group. March 4 2024
7. Blacksell M. (2006). *Political geography*. Routledge. March 4 2024
8. *Political geography* (1st ed.). (2021). . Routledge. March 4 2024
9. Wiley-Blackwell (Firm). (2020). *Political geography: a critical introduction* ([First Edition]). Wiley Blackwell.
10. Glassner M. I. & Fahrner C. (2004). *Political geography* (3rd ed.). Wiley.

<b>GEO-616</b>	<b>Medical Geography</b>	<b>3(3-0)</b>
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Introduction to Medical Geography: Definition and scope of Medical Geography, Historical development of the field, Key concepts and principles, Spatial perspectives on health and

disease. Disease Ecology and Epidemiology: Ecological factors influencing disease distribution, Epidemiological methods in Medical Geography, Spatial patterns of diseases, Disease diffusion and transmission. Health and Healthcare Systems: Global health patterns and disparities, Access to healthcare services, Geographies of healthcare delivery, Healthcare policy and planning. Environmental Health: Relationship between environment and health, Impact of pollution and climate change, Geographic perspectives on environmental justice, Spatial analysis of environmental health risks. Medical Cartography and GIS Applications: Mapping health data, GIS applications in Medical Geography, Spatial analysis of health trends, Disease mapping and surveillance. Social Determinants of Health: Social and economic factors influencing health, Geographies of social inequality and health disparities, Cultural influences on health behavior, Place-based interventions for health promotion. Spatial Access to Healthcare: Accessibility and healthcare utilization, Geographic barriers to healthcare access, Telemedicine and its impact, Case studies on improving healthcare access. Emerging Trends and Future Directions: Technology in medical geography, Geospatial analytics for health research, Discussion on the future of medical geography.

### **Bibliography**

1. Bonita, R., Beaglehole, R., & Kjellström, T. (2006). *Basic epidemiology*. World Health Organization.
2. Gatrell, A. C., & Elliott, S. J. (2014). *Geographies of health: An introduction*. John Wiley & Sons.
3. Hazen, H., & Anthamatten, P. (2019). *An introduction to the geography of health*. Routledge.
4. Meade, M. S., & Emch, M. (2010). *Medical geography*. Guilford Press.
5. *Epidemiology and geography: principles methods and tools of spatial analysis*. (2019). . ISTE ; John Wiley & Sons. March 4 2024
6. Meade M. S. & Emch M. (2010). *Medical geography* (3rd ed.). Guilford Press.
7. Jones K. & Moon G. (2022). *Health disease and society a critical medical geography*. ROUTLEDGE. March 4 2024
8. Akhtar R. Izhar N. & Verhasselt Y. (2010). *Global medical geography: essays in honour of prof. yola verhasselt*. Rawat Publications.
9. HUSAIN M. (2014). *Medical geography (perspectives in economic geography series)*. Concept Publishing Company. March 4 2024
10. HUSAIN M. (2014). *Medical geography (perspectives in economic geography series)*. Concept Publishing Company. March 4 2024

<b>GEO-618</b>	<b>Geography of Natural Hazards and Disasters</b>	<b>3(3-0)</b>
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Introduction to the course and learning objectives, Hazards and Disasters, Vulnerability, risk, resilience, capacity and adaptations, Classification of Natural Hazards, Phases of a Disaster, Effects of Disasters, Prevention, mitigation and preparedness, Factors of the nature and behavior of natural hazards, Vulnerability assessment and zonation, Risk assessment and the

governing factors, Geological Hazard, Earthquakes, Causes Effects and boundaries, Managing earthquake risk: Pre-disaster and post-disaster activities, Lessons from past disasters, Volcanoes, Introduction to volcanism, Characteristics of volcanic material, Types of volcanoes, Geographical distribution and major catastrophes, Effects of volcanism, Dealing with volcanism, Tsunamis, Causes of tsunamis, Global vulnerability to tsunamis, Management strategies for tsunamis, Mass movement hazards: Landslides, Introduction to basic concepts, Factors governing landslide hazards, Vulnerability assessment for landslide hazards, Landslides hazards distribution in Pakistan, Managing landslide risk, Climate and weather related hazards, Droughts, Aridity and droughts, Causes and factors of droughts, Types of droughts, Droughts in Pakistan, Drought and desertification, Combating droughts, Extreme temperature, Cold waves, Heat waves and heat strokes, Urban heat islands, Heat waves in Pakistan, Dealing with extreme temperatures, Dust storms, Occurrence of dust storms in Pakistan, Strategies to mitigate the effects of dust storms, Cyclones, Types and distribution, Management strategies, Floods and flooding, Definitions, River morphology and flooding, Causes and intensifying factors of floods, Types of floods, Floods in Pakistan, Flood mitigation measures, Floods risk assessment and management in Pakistan , GIS in Disaster management, Biological Hazards, Pandemics, Wars .

### **Recommended Books**

1. Alexander, D. (2018). *Natural disasters*. Routledge.
2. Davies, T. R., Korup, O., & Clague, J. J. (2021). *Geomorphology and Natural Hazards: Understanding Landscape Change for Disaster Mitigation*. John Wiley & Sons.
3. Hewitt, K. (2014). *Regions of risk: A geographical introduction to disasters*. Routledge.
4. Hyndman, D. (2010) *Natural Hazards and Disasters*. Third Editions. Published by Yollanda Cassio
5. Keller, E. A., & DeVecchio, D. E. (2019). *Natural hazards: earth's processes as hazards, disasters, and catastrophes*. Routledge.
6. *Natural hazards and the mitigation of their impact*. (2022). Springer. March 4 2024
7. *Risk and planet earth vulnerability natural hazards integrated adaptation strategies;vulnerability natural hazards*. (2020). . SCHWEIZERBART. March 4 2024
8. *Natural hazards gis-based spatial modeling using data mining techniques*. (2019). . Springer. March 4 2024
9. *Natural hazards : earth's processes as hazards disasters and catastrophes (Fifth)*. (2019). . Routledge Taylor and Francis Group. March 4 2024
10. *Natural hazards : explanation and integration (Second)*. (2017). . Guilford Press.

<b>GEO-620</b>	<b>Industrial Geography</b>	<b>3(3-0)</b>
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Nature Scope and New trends in Industrial Geography, Locational factors in manufacturing, concept of optimum locations, significance of cost and prices. Industrialization and its characteristics; The changing character of geographical concentration of Industries; Impact of technological changes; Recent trends of Industrialization. Theories of Industrial Location: the least cost school and the transport cost school, the market area school, the marginal area school, the behaviour school. Major Industries: Multi-locational industries- Iron and steel, oil refining; Market oriented industries-furniture, textile industries; Footloose industries- automobile, commercial, ship building, IT; Raw material oriented industries- the paper and pulp industry, the cement industry. Industrial regions: Definition and delineation and Important Industrial regions of the world, important industrial regions of Pakistan.

#### **REFERENCES:**

1. Bisht L. P. (2015). *Industrial geography*. Anmol Publications PVT. March 4 2024
2. *The oxford handbook of industrial hubs and economic development*. (2020). . Oxford University Press. March 4 2024
3. Barnes T. J. & Gertler M. S. (1999). *The new industrial geography : regions regulations and institutions*. Routledge. March 4 2024
4. *The ages of globalization : geography technology and institutions*. (2020). . Columbia University Press. March 4 2024
5. *Space place and capitalism : the literary geographies of the unknown industrial prisoner*. (2021). . Palgrave Macmillan. March 4 2024
6. *Drones as cyber-physical systems : concepts and applications for the fourth industrial revolution*. (2019). . Springer. March 4 2024
7. Alexander, J.W. : *Economic Geography* (Prentice Hall, New York).
8. *The innovation complex : cities tech and the new economy*. (2020). . Oxford University Press. March 4 2024
9. Giarratani F. Hewings G. J. D. & McCann P. (2014). *Handbook of industry studies and economic geography*. Edward Elgar Publishing. March 4 2024
10. Pacione M. (2014). *Progress in industrial geography (routledge revivals)*. Taylor and Francis. March 4 2024

<b>GEO-622</b>	<b>Spatial Data Visualization</b>	<b>3(2-1)</b>
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Introduction to Spatial Data Visualization: Importance of spatial data visualization, Principles of effective cartographic design, Visualization types: maps, charts, graphs, Tools and software for spatial data visualization. Cartographic Design Principles: Color theory and

symbolism in cartography, Typography and labeling in maps, Layout and composition, Interactive map design principles. Visualization Techniques for Vector Data: Symbolization and representation of vector data, Proportional symbols and graduated symbols, Choropleth maps and dot density maps. Visualization Techniques for Raster Data: Color schemes and rendering techniques, Hillshading and terrain visualization, Multispectral and hyperspectral visualization. 3D and Temporal Visualization: Principles of 3D visualization in GIS, Temporal data visualization techniques, Animation, and time-based maps. Web Mapping and Interactive Visualization: Web-based mapping technologies, Interactive map design principles, Geo-visualization tools and libraries. Advanced Spatial Data Visualization: Virtual and augmented reality applications, Data storytelling with spatial visualization, Visualization for decision support systems. Emerging Trends and Future Directions: Artificial Intelligence in spatial data visualization, Augmented reality (AR) and its impact, Ethical considerations in visualization.

**Practical:** Creating basic maps using GIS software, Designing a thematic map, Creating different thematic maps with vector data, Making aesthetically pleasing map layouts, Exploring Data classification methods, Enhancing raster data visualization, Creating 3D and temporal visualizations, Developing an interactive web map, Creating Cartographic Representations,

### **Bibliography:**

1. ESRI. (2024). *Resources for ArcMap* <https://www.esri.com/en-us/arcgis/products/arcgis/desktop/resources>
2. Kraak M. J. (2011). *Cartography : visualization of spatial data* (3rd ed.). Guilford Press.
3. Slocum, T. A., McMaster, R. B., Kessler, F. C., & Howard, H. H. (2022). *Thematic cartography and geovisualization* (4th ed.). CRC Press. <https://doi.org/10.1201/9781003150527>
4. The 3-d global spatial data model : principles and applications (Second). (2017). CRC Press. March 4 2024
5. TopoInVis (Workshop) Hotz I. Bin Masood T. Sadlo F. & Tierny J. (2021). *Topological methods in data analysis and visualization. vi theory applications and software*. Springer. March 4 2024
6. *Innovative approaches of data visualization and visual analytics*. (2014). Information Science Reference an imprint of IGI Global. March 4 2024
7. *Interactive data visualization : foundations techniques and applications* (Second). (2015). . CRC Press Taylor & Francis Group.

8. Grant R. (2018). *Data visualization : charts maps and interactive graphics*. Chapman and Hall/CRC. March 4 2024
9. *Interactive visual data analysis*. (2020). CRC Press.
10. Kirk A. (2012). *Data visualization : a successful design process : a structured design approach to equip you with the knowledge of how to successfully accomplish any data visualization challenge efficiently and effectively*. Packt Publ.