

**Physical Geography: Study of Climate Vegetation and Ocean
Geog: 301
Credit Hours (2+1)**

Objective:

To expose students with the founding principles of Geography and geographical knowledge.

Learning Outcomes:

At the end of the course, students will be able to:

1. Understand the fundamentals of Geography
2. Comprehend the key concepts of earth's evolution as a part of universe, and its major spheres.
3. Have knowledge of basic concepts and principles underlying Geographical events
4. Know various terms employed in understanding of different geographical processes and functions

Course Content:

Definitions & scope of geography, climate: an introduction to atmosphere, solar and terrestrial radiation, temperature (vertical & horizontal distribution), moisture and atmospheric stability, forms of condensation and precipitation, air pressure and wind circulation, air masses, disturbances, climatic regions, natural vegetation: major types of vegetation, world pattern of natural vegetation, ocean: global oceans & seas, structure of the ocean floor, salinity and its distribution, Sea temperature, oceanic surface and subsurface currents, tides, oceanic deposits.

Lab:

Isotherms, isobars, climographs, meteorological instruments, study of weather maps.

Suggested Readings:

- Strahler, A. H., & Strahler, A. 2013. *Introducing physical geography*. New York: Wiley.
- Fellmann, J. D., Getis, A. and Getis, J. 2005. *Human Geography: Landscapes of Human Activities*, 8th Edition, McGraw Hill: New York.
- Tarbuck, J.E and Lutgens, K.F. 2000. *Earth Science*, 9th Edition, Prentice Hall: New Jersey.
- Christopherson, W.R. 1997. *Geosystems: An Introduction to the physical Geography*, 3rd Edition, Prentice Hall: New Jersey.
- De Blij, H.J. 1995. *The Earth: An Introduction to its Physical and Human Geography*, 4th Edition, John Wiley: New York.
- Lutgens, K.F and Tarbuck, J.E. 1995. *The Atmosphere*, 6th Edition, Prentice Hall: New Jersey.
- Scott, C.R. 1989. *Physical Geography*, West Publication Company: St. Paul.
- Strahler, N. Arthur and Strahler, H. Alan, 1987. *Modern Physical Geography*, 3rd Edition John Wiley: New York.

McKnight, L.T. 1987. Physical Geography: Landscape Appreciation, 2nd Edition, Prentice-Hall: New Jersey.

Physical Geography: Study of Land forms and Soils
Geog: 302
Credit Hours (2+1)

Objective:

To create an understanding about the physical characteristics of the earth.

Learning Outcomes:

At the end of the course, students will be able to:

1. Comprehend the nature and scope of Physical Geography
2. Have knowledge of basic concepts, physical processes and principles of the subject
3. Know various terms employed in understanding of different physical features
4. Identify local landforms

Course Content:

The dynamic planet: internal structure of the earth, earthquakes, plate tectonics: continental drift theory, theory of plate tectonics and sea floor spreading, rocks & minerals: rock cycle, igneous, sedimentary and metamorphic rocks, minerals, volcanism: the nature of volcanic eruption and extruded material, volcanic cones, other volcanic landforms, intrusive igneous activity, mountain building: crustal uplift, rock deformation, mountain types, weathering, erosion & mass wasting, landforms developed by river, glaciers and winds, soil: soil formation, soil types, soil texture, soil profile.

Lab:

Construction of maps and diagrams, identification of rocks and minerals, methods of showing relief: contours (pattern, cross section).

Suggested Readings

Strahler, A. H., & Strahler, A. 2013. Introducing physical geography. New York: Wiley.
Pluijm, B. A.V. and Marshak, S. 2004. Earth Structure: An Introduction to Structural Geology and Tectonics, 2nd edition, W.W. Norton & Company: New York
Stoppato, C. M. and Bini A. 2003. Deserts: A Firefly Guide: Toronto: Ontario.
Tarbuck, J. E. and Lutgens, K. F. 2000. Earth Science, 9th edition, Prentice Hall: New York.
De Blij, J. H. 1995. The Earth: An Introduction to its Physical and Human Geography, 4th edition, John Wiley: New York.
Pellant, C. and Pellant, H. 1993. Rocks & Minerals, A Dorling Kindersely Book: London

Scott, C. R. 1989. Physical Geography, West Publishing Company: St. Paul.
Hamblin, K. W. 1985. The Earth's Dynamic Systems, 5th edition, Macmillan
Publishing Company & Collier Macmillan Publishers: New York.

Human Geography I
Geog: 401
Credit Hours (2+1)

Objective:

To expose students with the founding principles of Human Geography and associated subject matter including theories and Models.

Learning Outcomes:

At the end of the course, students will be able to:

1. Know the fundamentals of Human Geography including its meaning and scope.
2. Comprehend the earth is home of man, physical conditions limit us, we make things possible with knowledge and technology.
3. Understand the key concepts of Human Geography. Practices and customs of man such as Religion, Languages and Races.
4. Comprehend basic concepts, theories and models (Malthus and Central Place theory).
5. Recognize various terms employed in understanding of the subject.

Course Content:

Meaning and scope of human geography, man and environment relationship, population: population growth (Malthusian theory, demographic transition theory), population distribution, migration, language and religion: classification of languages, world pattern of languages, classification of religion, the principle religion, race: major racial groups and their distribution, settlements: classification of settlements (central place theory), urban and rural settlements (forms, functions and classification), political systems: national political systems (nations, states and nation-states), geographic characterization of states (size, shape, location, cores and capitals), classification of boundaries, international political system: the United Nations and its agencies, regional alliances, laws of the sea and maritime boundaries.

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 related to population.

Suggested readings:

Boyle, M. 2021. Human Geography: An Essential Introduction. John Wiley & Sons.
Rubenstein, J. M. 2010. Contemporary human geography.
Lindsay, J. 2006. Techniques in human geography. Routledge.

Fellmann, J. D., Getis, A. and Getis, J. 2005. Human Geography: Landscapes of Human Activities, 8th Edition, McGraw Hill: New York.

Rubenstein, M. James. 2004. The Cultural Landscape: An Introduction to Human Geography, Prentice Hall, Englewood Cliffs: New Jersey.

De Blij, H. J. 2003. Human Geography: Culture and Society, John Wiley and Sons Incorporated: New York.

Ahmad, Q. S. 2001. Fundamentals of Human Geography, Royal Book Company: Karachi.

Gregory, D., Martin, R., & Smith, G. (Eds.). 1994. Human geography: society, space and social science. Macmillan International Higher Education.

Scott, Foresman and De Blij, J. Harm. 1989. World Geography, Scott, Foresman and Company: Illinois.

Raw, Michael. 1986. Understanding Human Geography: A Practical Approach. Bell and Hymann: London.

Regional Geography
Geog: 402
Credit Hours (2+1)

Objectives:

To study the meaning of realms and geographic regions, the major regions of the world along with their characteristics.

Learning Outcomes:

The student will be able to:

1. Understand the meaning and scope of the subject
2. Meaning of geographic regions, major regions of the world.
3. Their political, economic, cultural and physical characteristics of the regions.

Course Content:

Meaning and scope of regional geography, the concept of region in geography, development of regional geography: the concept of natural regions and cultural regions types of regions: uniform regions, functional regions etc., main concepts of region: criteria, categories, characteristics, cores and boundaries, regional consciousness, world regional patterns: South Asia, South West Asia, South East Asia, north Africa, Sub-Saharan Africa, Western Europe, Eastern Europe, Nordic Europe, Mediterranean (Southern) Europe, Russia and Commonwealth of Independent States, North America, Middle America, South America, the Pacific Rim, the Pacific realm.

Lab:

Construction of maps and diagrams to show various characteristics of regions, assignment and presentation on regions.

Suggested Readings:

- Nijman, J., Shin, M. & Muller, O.P. (2020) *The World Today: Concepts and Regions in Geography*. 8th Edition. Willey
- Pulsipher, L., Pulsipher, A. & Johansson, O. (2020) *World Regional Geography: Global Patterns, Local Lives*. 8th edition. Macmillan
- Fouberg, H.E. & Moseley, G.W. (2017) *Understanding World Regional Geography*. 2nd edition. Wiley
- Mihelic, P. Lydia. 2005. *World Regional Geography: Global Patterns, Local Lives*, W.H. Freeman:New York.
- Hobbs, J. Joseph and Salter, L. Christopher. 2005. *Essentials of World Regional Geography*, Brooks Cole Publishing Company: Minnesota.
- De Blij, H.J. and Muller, O. Peter. 2005. *Concepts and Regions in Geography*, John Wiley and Sons, Incorporated: New York.
- De Blij, H. J. 2003. *Realms, Regions and Concepts*, John Wiley and Sons, Incorporated: New York.
- James, P.E. 1974. *One World Divided (Second Edition)*, John Wiley and Sons: New York

Human Geography II **Geog: 403** **Credit Hours (2+1)**

Objective:

To expose students with the knowledge of Human Geography and its subject matter including theories and Models.

Learning Outcomes:

At the end of the course, students will be able to:

1. Know the fundamentals of Human Geography including its meaning and scope.
2. Understand the key concepts of Human Geography like Economic activities for its income and economic resources. Global production and trade, minerals, renewable and Non-Renewable resources, industries, world trade, trade routes are main contents.
3. Comprehend basic concepts, theories and models (Von Thunen theory and Weber model, HDI index).
4. Distinguish various terms employed in understanding of the subject.

Course Content:

Economic activities: types and world patterns, primary activities: agriculture: origin and types of agriculture, Von-Thunen theory of agricultural location, agriculture resources (production and trade of major crops), fishing, lumbering, mining, (major mineral resources and non-mineral resources: production and trade of iron ore, copper, gold, coal, petroleum, natural gas), secondary activities: world manufacturing patterns, location factor in industry (Weber's theory), world production and trade of major

industries, pattern of high-tech industries, tertiary activities: transportation (mode of transportation), factors affecting transportation, world transportation pattern, international trade, major trade partners and organization, world trade pattern, energy resources: renewable and nonrenewable resources (thermal power, hydel power, solar power, wind power, nuclear power), economic development: world pattern of economic development, measures of economic development, poverty problem.

Lab:

Construction of maps and diagrams to show economic activities, world distribution of major crops, fishing grounds, major minerals, major industrial goods, trade pattern.

Suggested Readings:

- Sethi, N.M. 2021. The Environment of Pakistan New Edition.
- Khan, K.F. 2016. A Geography of Pakistan: Environment, People and Economy. Oxford University Press.
- Anderson, W. P. 2012. Economic geography. Routledge.
- Aoyama, Y., Murphy, J. T., & Hanson, S. 2010. Key concepts in economic geography. Sage.
- Combes, P. P., Mayer, T., & Thisse, J. F. 2008. Economic geography. Princeton University Press.
- Fingleton, B. (Ed.). 2007. New directions in economic geography. Edward Elgar Publishing.
- Fellmann, J. D., Getis, A. and Getis, J. 2005. Human Geography: Landscapes of Human Activities, 8th Edition, McGraw Hill: New York.
- Khan, F. K. 2005. Commercial Geography, Oxford University Press: Karachi.
- Rubenstein, M. James. 2004. The Cultural Landscape: An Introduction to Human Geography, Prentice Hall, Englewood Cliffs: New Jersey.
- De Blij, H. J. 2003. Human Geography: Culture and Society, John Wiley and Sons: New York.
- Ahmad, Q. S. 2001. Fundamentals of Human Geography, Royal Book Company: Karachi.
- Hartshorn, A. Truman and Alexander, W. John. 1999. Economic Geography. Prentice Hall, Englewood Cliffs: New Jersey.
- Hanink, M. 1997. Principle and applications of Economic Geography, Wiley: New York,
- Alexander, Gibson. 1997. Economic Geography, Prentice Hall of South East Asia: Singapore.
- Scott, Foresman and De Blij, J. Harm. 1989. World geography. Scott, Foresman and Company: Illinois.
- Raw, Michael. 1986. Understanding Human Geography: A Practical Approach. Bell and Hymann: London.

Map Work and Field Surveying

Geog: 404

Credit Hours (1+2)

Objective:

To train students in map drawing, reading and its use for geographical analysis

Learning Outcomes:

At the end of the course, students will be able to:

1. Produce maps with basic cartographic techniques
2. Identify observable and measurable knowledge, skills, and attitudes values on the map.
3. Create real world globe on paper with the help of map projections.
4. Capable of mapping of Large scale maps.

Course Content:

Maps and essentials of maps (scale, legend, north arrow, projection, conventional signs) types of maps, scales, types of scales: simple statement, representative fraction (R.F.) scale, graphical scale(linear and diagonal), map projections, types of map projections: cylindrical projections (equal area and Mercator's), conical projections (one standard parallel ,two standard parallel) and zenithal projections (equal area, equidistance, gnomonic, and stereographic), digitization of map features, interpretation of maps: methods of showing relief, interpretation of topographical maps, preparation of maps and graphs using statistical data: pie graph, bar graphs, thematic map: dot maps choropleth maps, isopleths maps, surveying, types of surveying (chain survey, plane table survey, theodolite survey), introduction to global positioning system (G.P.S).

Lab:

Field survey with the help of following instruments: plane table, engineer's chain, construction of scales, graticules of map projections, thematic maps, pie graph and bar graph.

Suggested Readings:

Monmonier, M., 2019, Connections and Content: Reflections on Networks and the History of Cartography, ESRI Press, USA
Paul L. Gay. 2016. Land Surveying Simplified Paperback – June 25, 2016. Lulu.com.
Wolf, Paul R. and Ghilani, C.2005.Elementary Surveying: An Introduction to Geomatics, 11thEdition.PrenticeHall: New Jersey.
Robinson, Kimberling. 2000. Elements of Cartography, sixth edition, John Wiley: New York.
Campbell, John.1991. Map Use and Analysis, WMC. Brown Publishers: Iowa
Singh, R.L. 1979. Elements of Practical Geography, Kalyani Publishers: New Delhi.
Monkhouse, F. J. 1976. Maps and Diagrams, Methuen & Company: London.
Singh, R. L. 1964. Map Work and Practical Geography, Kalyani Publishers: New Delhi.
Bygott, J. 1955.An Introduction to Map Work and Practical. Geography, University Tutorial Press: London.

Human Geography
Geog:451 (Sub.)
Credit Hours (2+1)

Objective:

To expose students with the founding principles of Human Geography and associated subject matter including theories and Models.

Learning Outcomes:

At the end of the course, students will be able to:

1. Know the fundamentals of Human Geography including its meaning and scope.
2. Comprehend the earth is home of man, physical conditions limit us, we make things possible with knowledge and technology.
3. Understand the key concepts of Human Geography. Practices and customs of man such as Religion, Languages and Races.
4. Comprehend basic concepts, theories and models (Malthus and Central Place theory).
5. Recognize various terms employed in understanding of the subject.

Course Content:

Meaning and scope of human geography, population, race, language and religion, settlements, political system, economic activities, agriculture resources, mineral resources, industry, world pattern of trade, energy resources and economic development. Malthus Theory, Central Place Theory, Von Thunen Model, Weber industrial model.

Lab:

Construction of maps and diagrams to show world distribution of population, religions, languages and races, major crops, fishing grounds, major minerals

Suggested Readings:

- Boyle, M. 2021. Human Geography: An Essential Introduction. John Wiley & Sons.
- Sethi, N.M. 2021. The Environment of Pakistan New Edition.
- Khan, K.F. 2016. A Geography of Pakistan: Environment, People and Economy. Oxford University Press.
- Rubenstein, J. M. 2010. Contemporary human geography.
- Khan, F.K. 2005. Commercial Geography, Oxford University Press: Pakistan
- Rubenstein, M. James. 2004. The Cultural Landscape: An Introduction to Human Geography, Prentice Hall: New Jersey.
- De Blij. H. J. 2003. Human Geography: Culture and Society, John Wiley and Sons: New York.
- Fellmann, J. D., Getis, A. and Getis, J. 2003. Human Geography, McGraw Hills: New York.
- Ahmad, Q. S. 2001. Fundamentals of Human Geography, Royal Book Company: Karachi.

Hartshorn, A. Truman and Alexander, W. John. 1999. Economic Geography, Prentice Hall, Engle wood Cliffs: New Jersey.
Scott, F. and De Blij, H. J. 1989. World Geography, Scott Fores man and Company: Illinois.
Raw, Michael. 1986. Understanding Human Geography: A Practical Approach, Belland Hymann: London.

Geomorphology
Geog: 503
Credit Hours (2+1)

Objective:

To interpretation students with the knowledge of Geomorphology and its importance.

Learning Outcomes:

At the end of the course, students will be able to:

1. Understand the fundamentals of Geomorphology its scope.
2. Comprehend the key concepts of Geomorphology like earth structure, geological time scale, rocks type and geomorphic processes.
3. Comprehend with subject matter including various landforms such as folded and faulted structures, Isostasy, Plate Tectonics, Fluvial Processes and Landforms, Aeolian process and landforms, Glacial Landforms, wave action and coastal land forms and karst topography.
4. Distinguish various terms and can utilize topo sheet.
5. Know drainage patterns, Calculation of basin area, bifurcation ratio, drainage density.

Scope, historical development and fundamental concepts of geomorphology, factors of landforms development: geomorphic processes, geological structure and time, weathering and mass wasting: creation and modification of landforms by weathering and mass wasting, topography of folded and faulted structures, Isostasy, Plate Tectonics, Fluvial Processes and Landforms, Aeolian process and land forms, Glacial Landforms, waves action and coastal land forms, geomorphology of karst region.

Lab:

Construction and interpretation of geomorphic maps, geological structure, study of drainage patterns, Calculation of basin area, bifurcation ratio, drainage density, field study to develop understanding about geomorphic processes and various landforms.

Suggested Readings:

Huggett, R. J. 2016. Fundamentals of geomorphology. Routledge.
Strahler, A. H., &Strahler, A. 2013. Introducing physical geography. New York: Wiley.
Hess, D., &Tasa, D. 2011. McKnight's physical geography: a landscape appreciation (p. 688). Upper Saddle River, NJ: Prentice Hall.

- Christopherson, R., Birkeland, G. H., Byrne, M. L., & Giles, P. T. 2009. Geosystems: An Introduction to Physical Geography (4th Canadian edition).
- Schaetzl, R. J. and Anderson, S. 2005. Soils: Genesis and Geomorphology, Cambridge University Press: Cambridge.
- Huggett, R., Lindley, S., Gavin, H., & Richardson, K. 2004. Physical geography: a human perspective. Arnold, Hodder Headline Group.
- De Blij, H. J., Muller, P. O., & Williams, R. S. 2004. Physical geography: the global environment (Vol. 2). Oxford University Press.
- Kondolf, G. M., & Piégay, H. (Eds.). 2003. Tools in fluvial geomorphology (Vol. 696). Grã-Bretanha: Wiley.
- Thornbury, W.E. 2002. Principle of Geomorphology, John Wiley and Sons: New York.
- Ritter, Kochel and Miller. 2001. Process Geomorphology, John Wiley and Sons: New York.
- W.K. Hamblin. 2000. The Earth Dynamic Systems, Longman: UK.
- Strahler, A.N. 2000. Elements of Physical Geography, John Wiley and Sons: New York.
- Tarbuck, J. E. and Lutgens, K. F. 2000. Earth Science, 9th edition, Prentice Hall: New York.
- W.K. Hamblin. 1998. Introduction to Physical Geology, Longman: UK.
- Thorn, C. E. (Ed.). 1996. The scientific nature of geomorphology. Bruce Rhoads.
- Bridges, E. M., Edwin Michael, B., & Bridges, E. M. B. 1990. World geomorphology. Cambridge University Press.
- Small, R.J. 1989. Geomorphology and Hydrology, Longman: London.
- Thorn, C.E. 1987. An Introduction to Theoretical Geomorphology, Unwin Hyman: Boston.
- Leopold and Wolman. 1987. Fluvial process in Geomorphology, John Wiley: New York.
- McCullagh, P. 1987. Modern concepts in Geomorphology, Harper & Co: London.
- Chorley. 1986. Spatial analysis in Geomorphology, John Wiley: New York.
- Robinson, Harry. 1983. Morphology and landscape, Muller Publication: New York.

Economic Geography
Geog:504
Credit Hours (2+1)

Objective:

To create an understanding of Spatial variations of Economic resources and activities with reference to global and national scenarios.

Learning Outcomes:

By the end of this course, the student will be able to:

1. Recognize the significance of geographic concepts for understanding socio-economic processes.
2. Know the global distribution of economic activities.
3. Understand current economic and political events.
4. Identify geographical trends in economic processes and outcomes of societies.

Course Content:

Scope and function of economic geography, defining economic geography: defining world economic activities, the classification of economic activities, economic challenge in future, the changing world economy: economic organization and spatial change, spatial divisions of labor, global patterns and trends: economic development means, international patterns of resources and population, international patterns of industry and finance, interpretations of international inequality, the geographical dynamics of the world economy: states and the world economy, market-access and the regional motors of the new world economy, the globalization of production systems: economic challenge in future, economic resources: an overview, economic resources and their distribution, implication of resource development, resource management, industrial locations and industrial development, international trade: world trade pattern, international trade bodies, international trade agreements, international transportation and communication: means and modes of international transportation, world trade routes; sea routes & air routes, marine transportation, transport management.

Lab:

Construction of statistical maps using a variety of methods with help of relevant data.

Suggested Readings:

Neil M. Coe, Philip F. Kelly, Henry W. C. Yeung. 2019. Economic Geography: A Contemporary Introduction, 3rd Edition. Wiley-Blackwell.

Danny MacKinnon, Andrew Cumbers. 2019. An Introduction to Economic Geography Globalization, Uneven Development and Place, 3rd Edition, Routledge.

Robert, B. Gibson. 2005. Sustainability Assessment, Earth Scan: London.

Fellmann, J. D., Getis, A. and Getis, J. 2003. Human Geography, McGraw Hills: New York.

Ahmad, Q.S. 2001. Fundamentals of Human Geography, Royal Book Company: Karachi.

Hartshorn, A. Truman and Alexander, W. John, 1999. Economic Geography Prentice Hall, Englewood Cliffs: New Jersey.

Hanink, M. 1997. Principle and applications of Economic Geography, Wiley: New York,

Alexander, Gibson. 1997. Economic Geography, Prentice Hall of South East Asia: Singapore.

Knapp, B.J., Ross, S.R. and McCrae, D.L.R. 1994. The challenge of Economic Environment, Pearson: Delhi.

Henink, D. 1994. The international Economy: A Geographical perspective, John Wiley, New York.

Cultural Geography
Geog: 505
Credit Hours (2+1)

Objectives:

The main objectives of this course to provide knowledge and develop skill about the cultural characteristics and understanding about cultural landscape. The course is designed that students explore stone age culture are artifacts.

Learning Outcomes:

The outcome of the course is that students would be capable to identify various culture and techniques of classifying stone implements and artifacts of various regions.

Course Content:

Examines the concepts of culture as it relates to the geographic landscape. Topics include the built environment, symbolic landscapes, representation of place in film, literature, photography, and music, subaltern geographies, landscapes and cultures of work, and place-situated identity. Course provides an overview of research methods and themes in cultural geography.

Lab:

Lab and assignment work related to various cultural regions of the world highlighting important cultural traits. Field trip and field research required.

Suggested Readings:

Jordan-Bychkov, Domosh, T., Neumann, R. P. and Price, P. L. 2018. The Human Mosaic, W. H. Freeman:New York.

Angrew, Jhon, David and N. R. Alisdair. 2015. Human Geography: An Essential Anthropology, Blackwellpublisher: Boston.

Jeckson, Peter. 2016. An introduction to Cultural Geography, Blackwell publishers:Boston.

Spencer, J.E. and Thomas, W.I. 1978. Introducing Cultural Geography, John Wiley and Sons: New York.

Jan.O. M, and Broek, John W. Webb. 1968. The Geography of Mankind, McGraw-Hill: London.

Cartography
Geog: 506
Credit Hours (1+2)

Objectives:

Major objective of this course is to describe the importance of mapmaking tools in Geography. Students should learn that how to deal with different types of data for map making.

Learning outcomes:

After completion of this course students easily understands the major types of maps, uses of maps and can be deal with multiple data types. Widely use of Computer cartographic techniques provide students an opportunity to understand the digital cartography.

Course Content:

Meaning and scope of cartography, ethics of mapmaking and map use, historical development of cartography: cartography in ancient period, cartography in middle ages, cartography in modern ages, elements of map: projection, scale and generalization, symbolization, categories of maps and their purposes, map projections: basic geodesy, major types of projections, choices of projections, coordinate systems, sources of spatial data: ground survey and positioning (GPS), air photo and remote sensing data census and sampling, cartographic specialties: choropleth maps, isopleth maps, dot maps, pictorial and flow line maps, cartograms ergo graph etc. map specifications: Color and pattern use, topography and map lettering, , computer cartography: use of GIS in cartography, map digitization, digital image processing, web based map developments.

Lab:

Historical evaluation of maps, Construction of graticules by using following map projection (mathematical methods) simple cylindrical, Conical One Standard Parallel Projection, zenithal equidistant projection, statistical maps and diagrams: choropleth map, isopleth map, dot map, flow line, pictorial maps, proportion circles, divided circles etc. ergo graph, cartogram, construction of digital maps, construction of web based maps.

Suggested Readings:

- Peterson, G. N., 2020, GIS Cartography, A guide to Effective Map Design, CRC Press, USA
- Monmonier, M., 2019, Connections and Content: Reflections on Networks and the History of Cartography, ESRI Press, USA
- Ferdinand, S., 2019, Mapping Beyond Measure, University of Nebraska Press, USA
- Longley, A. P., 2005. Geographical Information system and science, 2nd edition, John Wiley & Sons:New York.
- Kraak, M. J. &Ormeling, F., 2005, Cartography, Pearson Education Limited, India
- Khan, J.A., 2002. Map projection, Rahber Publisher: Karachi.
- Robinson, K., 2000. Elements of Cartography, sixth edition, John Wiley: New York.
- Dent, B. D., 1999, Cartography, Thematic Map Design, WCB, McGraw-Hill, USA.
- Dorling, D. and Fairdirm, D., 1997, Ways of Representing the world, Longman: New York
- Campbell, J., 1991, Introductory Cartography, William C. Brown Pub. USA.
- Ahmad, Q.S., 1968. Simple Map Projection, Publishers United Limited: Lahore.

Climatology
Geog: 508
Credit Hours (2+1)

Objectives:

To understand the elements and factors of climate, spatial and temporal variations in weather and climate.

To familiarise students with the major climatic regions of the world and Pakistan.

Learning Outcomes:

By the end of this course, the student will be able to:

1. Have knowledge of the nature and scope of the subject.
2. Explain the difference between weather and climate
3. Understand the global atmospheric processes, disturbances and the key issues of climate change
4. Comprehend World's major climatic region

Introduction, atmosphere: composition, structure, air temperature (including insolation): general, by latitude, by season, terrestrial heat budget, vertical distribution, horizontal distribution, stability and instability, lapse rate, pressure: vertical distribution, horizontal distribution of pressure at sea level, local winds and oceans currents, general circulation of atmosphere, seasonal winds (monsoon), moisture and precipitation: hydrology cycle, absolute, specific and relative humidity, process of condensation: fog and clouds, instability of atmosphere, tornado, thunderstorm, zonal distribution of precipitation, air masses, fronts, cyclones: tropical and extra tropical, climatic classification Koppen Geiger, climatic change.

Lab:

Climograph of one station, Weather map of Pakistan, copying of data from climatic normal of specific elements for stations and calculation of summer / winter means temperature, plotting of data on maps, drawing of iso-lines on maps and their interpretation, Development of Wind Rose, Study of Weather Satellite Data and Interpretation of Synoptic maps.

Suggested Readings:

Hulme, M. 2021. Climate Change. 1st Edition. Routledge.

Sullivan, D. 2019. Climatology: Concepts and Applications. ML Books International –IPS.

Renneboog, R. (ed.)2018. Principles of Climatology. Salem Press.

Gemeda, D. 2015 Introduction to Climatology and Meteorology. LAP LAMBERT Academic Publishing.

Khan, A. J. & Arsalan, H.M. 2007. General Climatology. Department of Geography. University of Karachi.

Thompson, D. R. and Perry, A. 2005. Applied Climatology. 1st Edition. Taylor and Francis: London.

Barry, G. R. 2001. Synoptic and Dynamic Climatology. 1st Edition. Routledge: New York.

Khan, A. J 1993. The Climate of Pakistan, Rehbar Publishers: Karachi.
Strahler, A.N. 1992. Modern Physical Geography, John Wiley: New York
Hobbs, E. J. 1980. Applied Climatology: A study of atmospheric resources. Westview Press: San Francisco.
Berry, B.J.L. and Chorley, R. 1971. Atmosphere, Weather, Climate, Methuen: London.
Trewartha, G.T. and Finch, J. 1967. Physical Elements of Geography, McGraw Hills: New York.
Trewartha, G.T. 1954. An Introduction to Climate, McGraw Hill: New York.

History and development of Geographic Thoughts

Geog: 509

Credit Hours (2+1)

Objectives:

The main objectives of this course to provide knowledge and develop skill about the historical development of geography, its foundation and progress from Greek period to modern period.

Learning Outcomes:

The outcome of the course is that students would be capable to understand development of geographical thought and themes of geography.

Course Content:

The Spirit & Scope of Geography: geography as a study of variable character of the earth's surface(Man-land system), the concept of occupied space, main themes and traditions, historical perspective of development of geographic thought: geography in Ancient period, geography in the Middle ages: Muslim contribution, European contribution, modern geography & its furtherance: founder of modern geography (Humboldt & Ritter), geography after Humboldt & Ritter, specialization and quantitative revolution, tradition in the focus of study: earth science, area study, spatial organization, man land tradition, and cartography, geography as a nomothetic science, ideographic verses nomothetic debate, geography in Pakistan: development of post graduate research& teaching, research tradition, focus of studies, future of geographical research.

Lab:

Presentation/written assignment on various topics of the history of the development of Geography.

Suggested Readings:

Aitken, S and G. Valentine. 2016. Approaches to Human Geography, Sage Publications: London.

Qureshi, M.U. 2015. Encyclopedia of Geographical Thoughts, volume 2, Anmol Publications: New Delhi.

Johnston, R.J. 2000. Geography and Geographers, Arnold: London.

Jensen and Arild Holt. 1999. Geography its History and Concepts, Harper & Row: London.
Geoffrey, J. Martin and James, P.E. 1993. All Possible Worlds: A History of Geographical Ideas, Wiley: New York.
Haggett, P. 1990. The Geographer's Art, Blackwell: Cambridge.
Harvey, M.E. and Holly, B.P. 1981. Themes in Geographic Thought, Croom Helm: London.

Map and Air Photo Analysis
Geog: 510
Credit Hours (1+2)

Objectives:

- To introduce knowledge of recording earth's surface features from air-borne platforms.
- To enable students to develop an understanding of object based analysis
- To generate understanding about topographical maps and aerial photographs etc.
- To develop a comprehension regarding ground-truthing aided by GPS.

Learning Outcomes:

By the end of this course, the student will be able to:

1. Have knowledge about the evolution of aerial photography
2. Develop a comprehension of topographical maps/aerial photography and data extraction
3. Have visual Interpretation skills
4. Detect land use/land cover changes

Course Content:

Scope of map and air photo analysis, map interpretation: techniques of map interpretation, interpretation of thematic maps, location (absolute, relative) on a map: grid and grid references, British method, UTM (Universal Transverse Mercator grid system), bearing, interpretation of topographical maps: physical features (Karst topography, glacial topography, drainage pattern etc.), cultural features: (urban and rural settlements, transportation, irrigation and agriculture etc.). detour Index transport. Aerial photography: history of aerial photography, mechanism of aerial photography, geometry of a vertical photograph (photographic centers: principle point, iso-center, nadir), Principles of Stereoscopic vision, Measurement on Aerial Photograph: Scale of Aerial Photograph, Bearing, Height, focal Length, Application of aerial image: land forms and drainage, land use planning, Geology, soils and engineering, natural resources and management, forestry. Air photo recognition elements (shape, tone, shadow, texture, site, situation, size, pattern etc.). Films of Aerial Photography, Aerial images and GIS (Geographic Information System), Use of GPS (Global Positioning System).

Lab.

Construction of British and UTM grid system, calculation of bearings, identification of physical and cultural features on the topographical maps. Manual and digital conversion of unit systems (from decimal to degree, minutes and seconds and vice versa). Identifying absolute locations of topographical sheets on googleEarth. Use of GPS for identifying locations. Study of relief, drainage pattern, drainage density, Bifurcation ratio, rural settlement types and irrigation on the topographical maps, interpretation of topographical maps of different areas of Pakistan, calculating of scale, nadir, principle point, height, focal length and displacement on the aerial photographs, identification of features on air photographs, stereoscopic vision, development of thematic maps and interpretation of air photographs and mosaics.

Suggested Readings:

- Aber, J. S., Marzol, f. I., &Ries, J. (2010) Small-Format Aerial Photography: Principles, Techniques and Geoscience Applications, Elsevier, Amsterdam.
- Monmonier, M., 2019, Connections and Content: Reflections on Networks and the History of Cartography, ESRI Press, USA
- David P. Paine, James D. Kiser.2012. Aerial Photography and Image Interpretation, Third Edition, John Wiley & Sons, Inc.
- Paine, P. 2002. Aerial photography and image interpretation, John Wiley: New York.
- Monmonier, M. Spying with Maps: Surveillance Technologies and the Future of Privacy, University ofChicago Press: Chicago.
- Campbell, J. 2001. Map use and Analysis, Mcgraw Hill: New York.
- Robinson H. Arthur and Morrison. 2000. Elements of Cartography, 6th edition, John Willey: New York.
- G.C. Dickenson. 1979. Maps and Air photographs, Edward Arnold: London.
- Abeedullah, Jan. 1972. Fundamentals of Photo interpretation and Photogrammetry, Forest Institute:Peshawar.
- Singh, R.L. 1964. Map Work and Practical Geography, Kalyani Publishers: New Delhi.
- Walker, F. 1964. Geography from the Air, Methuen: London.

Quantitative Methods

Geog: 511

Credit Hours (2+1)

Objective:

To understand students with the knowledge of Quantitative methods (statistics) and its importance. How this subject is useful for understand and quantify geographical problems and social research.

Learning Outcomes:

At the end of the course, students will be able to:

1. Comprehend the fundamentals of basic statistics.

2. Know the data type and its calculation.
3. Can draw and plot different tables and graphs.
4. Able to use z tables in hypothesis testing.

Scope of quantitative methods in geography, historical background and application of quantitative methods in geography, geographic data: primary, secondary, qualitative and quantitative data, discrete data and continuous variables, measure of central tendency, measure of dispersions, skewness and kurtosis, correlation and regression - hypothesis, spatial analysis: nearest neighbor index (NNI), Lorenz curve and Gini coefficient, calculation of shape index, calculation of accessibility index.

Lab:

Frequency table, histogram, frequency polygon, computation of arithmetic mean, mode, median, mean deviation, standard deviation, coefficient of variance, skewness and kurtosis. Linear correlation (product moment and rank correlation), test of hypothesis, linear regression, nearest neighbor index, shape index and accessibility index, digital exercises

Suggested Readings:

Harris, R. 2016. Quantitative geography: The basics. Sage.
 Gomez, Basil, and John Paul Jones III, eds.2010. Research methods in geography: A critical introduction. Vol. 6. John Wiley & Sons.
 Burt, J. E., Barber, G. M., & Rigby, D. L. 2009. Elementary statistics for geographers. Guilford Press.
 Lindsay, J. 2006. Techniques in human geography. Routledge.
 Fotheringham, A. Stewart, Brunson, C. and Martin E. 2000. Quantitative Geography: Perspectives on Spatial Data Analysis, Sage Publications: New York.
 King, G. 2000. Geography, statistics, and ecological inference.
 Giri, P. K., & Bannerjee, J. 1999. Introduction to statistics. Academic Publishers.
 Burt, J. and Barber, G. 1996. Elementary statistics for Geographers, The Guilford press: New York.
 Yeates, Maurice. 1996. An Introduction to Quantitative Analysis in Human Geography, Mc. GrawHill: New York.
 Levin, J. and Fox. 1996. Elementary Statistics in Social Research, Longman: New York.
 Saroj, Pal. 1995. Computing Mathematical Techniques in Geography, B.R. Publishing.

Geography of Pakistan
Geog: 512
Credit Hours (2+1)

Objectives:

The major objective of this course is to provide the knowledge about the Physical, Cultural, Socio-economic and environmental condition of Pakistan.

Learning Outcomes:

Understanding the importance of Geography of Pakistan and its scope with the unique topographical structure of Pakistan.

Develop analytical skills among students for understanding the land, population, man-environment relationship and issues of Pakistan.

Understanding the geographical problems and environmental hazards of Pakistan.

Course Content:

Introduction of Pakistan, Geographical location of Pakistan, neighboring countries of Pakistan, Physiography of Pakistan, Climate of Pakistan: General weather condition: Temperature of hot season, cold season, Distribution of rainfall, Climatic regions Based on Koppen's and Thornwaite classification. Soil and vegetation of Pakistan: Major soil groups and soil regions, Major vegetation groups. Population: Growth, Density, Distribution and migration in Pakistan Urban development and urbanization. Economy of Pakistan: Farming techniques, problems and progress, waterlogging and salinity reclaiming projects, food grain growing regions. Cash crops growing regions. Mineral and their uses, power resources, Resource base for the industries, Industrial regions.

Lab:

Students are required to prepare different maps to show landforms, climatic conditions, vegetation and soil patterns, population distribution. Agricultural crops, irrigation system transportation and communication networks mineral deposits, Industries and settlement patterns of Pakistan. Field Visit of any

Suggested Readings:

Spate, O.H.K. & Learmonth, A. T. A. 2018. India and Pakistan: A General and Regional Geography, Routledge Library Editions: British in India.

Khan, F. K. 2006. Pakistan Geography, Economy and People, Oxford University press: Karachi.

Rahman, M. 2002. Agriculture in Pakistan, Akademiai Kiado

K.M. Shamshad. 1988. The Meteorology of Pakistan, Royal Book: Karachi.

Nabi, H. and Zahid. 1987. The Agrarian Economy of Pakistan: Oxford University Press, Pakistan.

Khan, A. J. 1993. The climate of Pakistan, 1st Edition, Rehbar Publishers: Karachi.

Kazi, S. Ahmad, F. 1966. A Geography of Pakistan, Karachi Oxford University Press: Karachi.

Ahmad, Uddin, and Kazi. 1969. A Geography of Pakistan, 2nd Edition, Oxford University Press: Karachi.

Johnson, B. L.C. 1979. Pakistan. Heinemann: London.

McCartney, M. & Zaidi, S. A., 2019, New Perspectives on Pakistan's Political Economy: State, Class and Social Change, Cambridge University Press.

South Asia
Geog:521
Credit Hours (2+1)

Objectives:

To study the meaning of realms and South Asian regions, the major regions of the world along with their characteristics.

Learning Outcomes:

The student will be able to:

1. Understand the meaning and scope of the subject
2. Meaning of geographic regions, major regions of the world.
3. Their political, economic, cultural and physical characteristics of the regions.

Introduction: geographic qualities of south Asia, physiographic regions, the human sequence: population & settlement, Pakistan: historical background, physical environment: relief and drainage, climate, land use patterns: agriculture, industry, transport, minerals and power, population, trade and urbanization, India: Physiography and climate, India's development: soil and agriculture, mineral resources and industrialization, demographic crisis: India's dilemma, demographic cycles, urbanization, the east: Bangladesh: historical background, physical environment: relief and drainage, climate, land use patterns: agriculture, industry, transport, minerals and power, population trade and future prospects with special reference to the conditions in the country, Sri Lanka- Island of the South Asia: introduction and location, relief and drainage, climate and natural vegetation, geographical regions, agriculture-types of farming, fishing industry, minerals and industry, population, trade and transport, future prospects, mountainous north: Nepal and Bhutan.

Lab:

Collection of latest data and compilation of maps on the topics listed above

Suggested Readings.

- Mihelic, P. Lydia. 2005. World Regional Geography: Global Patterns, Local Lives, W.H. Freeman.: New York.
- Hobbs, J. Joseph and Salter, L. Christopher. 2005. Essentials of World Regional Geography, Brooks Cole Publishing Company: Minnesota.
- De Blij, H.J. and Muller, Peter. O. 1997. Geography, Realms/Regions and concepts, John Wiley and Sons: New York.
- Breton, Roland J. L. 1997. Atlas of the Languages and Ethnic communities of South Asia, 2nd edition, Alta Mira Press, New York.
- Dutt, Ashok, K. 1987. Atlas of South Asia, Westview: Jackson.

South West Asia
Geog: 522
Credit Hours (2+1)

Objectives:

To study the principle under which the south West Asia region is divided, the major characteristics of the region, along with the conflicts and the influence on the global politics.

Learning Outcomes:

The student will be able to:

1. Understand the meaning and scope of the subject
2. The political and physical division of the region.
3. Their political, economic, cultural and physical characteristics of the region.
4. The major role played by the region in international politics.

Course Content:

Introduction: Tri-continental junction, major physical and cultural characteristics, historical background, pattern of people and culture, physical features: landforms, water resources (river/ground water/ oasis), climate: major climatic factors, elements of climate, soils, vegetation and animal life: ecological relationships and soils, major soil pattern, vegetation patterns, and animal life, agriculture: rainfed crop farming, irrigation, riches beneath the earth: petroleum and gas, patterns of resources/production, major oil facilities, OPEC and marketing, other minerals, manufacturing: Patterns of Industry, Regional development problem, settlements: urbanization, selected cities.

Lab.

Students are required to prepare assignments/lab work related to various aspects of southwest Asian states

Suggested Readings:

- Pulsipher, L., Pulsipher, A. & Johansson, O. 2020 World Regional Geography: Global Patterns, Local Lives. 8th edition. Macmillan.
- Finlayson, C. 2019 World Regional Geography. Caitlin Finlayson, University of Mary Washington
- Colbert, C. H. 2005 Middle East Patterns: Places, Peoples, and Politics, Westview Press: Jackson
- Anuery, H. & Wolf, A. 2000 Water in the Middle East: A Geography of peace, Texas press: Austin
- Beaumont, P. G. H. Blake and Wag staff, J. M. 1998. The Middle East, A geographical study, Halsted Press: New York.
- Dawood, A.S. and Karan. 1990. International boundaries of Saudi Arabia, Galaxy: Delhi.
- Blake, G.H. and Schofield, R.N. 1987. Boundaries and state territories in the Middle East and North Africa, MENA Press: Cambridge
- Fisher, W.B. 1978. The Middle East, Methun: London

Kheirabadi, M. 1978. Iranian cities: Formation and development, University of Texas Press: Austin. Cressay, G.B. 1960. Cross roads: land & life in Southwest Asia, Lippincott: Chicago.

Southeast Asia
Geog:523
Credit Hours (2+1)

Objectives:

To study the meaning of realms and South East Asian region, the major regions of the world along with their characteristics.

Learning Outcomes:

The student will be able to:

1. Understand the meaning and scope of the subject
2. Meaning of geographic regions, major regions of the world.
3. Their political, economic, cultural and physical characteristics of the regions.

Regional geography of South east Asia, physical framework, climate, soil and vegetation, population, economic development agriculture and plantation, minerals industries, trade and transport.

Lab:

Construction of maps, collection of data

Suggested Readings:

Pulsipher, L., Pulsipher, A. & Johansson, O. 2020 World Regional Geography: Global Patterns, Local Lives.8th edition. Macmillan.

Weightman, B. A. 2005. Dragons and Tigers: A Geography of South, East, and Southeast Asia. John Wiley & Sons: New York.

Hobbs, J. Joseph and Salter, L. Christopher. 2005. Essentials of World Regional Geography, Brooks Cole Publishing Company: Minnesota.

Mihelic, P. Lydia. 2005. World Regional Geography: Global Patterns, Local Lives, W.H. Freeman: New York.

De Blij, H.J. and Muller, Peter. O. 1997. Geography, Realms/Regions and concepts, John Wiley and Sons: New York.

Scott, Foreman and J. H, De Blij. 1989. World geography Scott, Foresman and Company: Illinois.

James, P.E. 1964. One World Divided: A Geographer Looks at the Modern World, Blasdell publishing Company: Toronto.

North Africa
Geog:526
Credit Hours (2+1)

Objectives:

To study the meaning of realms and South North African region, the major regions of the world along with their characteristics.

Learning Outcomes:

The student will be able to:

1. Understand the meaning and scope of the subject
2. Meaning of geographic regions, major regions of the world.
3. Their political, economic, cultural and physical characteristics of the regions.

General consideration: The region of North Africa-an introduction, sub divisions of North Africa, The global importance of North Africa, the rise of Islam in North Africa, physical environment: structure and relief, vegetation and soil, landscapes, climate, environmental hazards, human and natural resource: population, agriculture, livestock, oil, gas and minerals, transport, the Suez-canal, study of North African countries: Morocco, Tunisia, Libya, Egypt, and Sudan.

Lab.

Lab work including map work and assignment related to physical and economic aspects of the states of North Africa.

Suggested Readings.

- Pulsipher, L., Pulsipher, A. & Johansson, O. 2020 World Regional Geography: Global Patterns, Local Lives.8th edition. Macmillan.
- Hobbs, J. Joseph and Salter, L. Christopher. 2005. Essentials of World Regional Geography, Brooks Cole Publishing Company: Minnesota.
- Mihelic, P. Lydia. 2005. World Regional Geography: Global Patterns, Local Lives, W.H. Freeman. New York.
- Littell, M. 2002. World Cultures and Geography. McDougal Littell: Boston.
- Har-el, Julia. 1992. The Middle East and North Africa: Multicultural Geography. American school publishers: New York.
- Jarrett, H.R. 1971. An outline Geography of Africa, Methuen: London.

North America
Geog:528
Credit Hours (2+1)

Objectives:

To study the meaning of realms and South North American region, the major regions of the world along with their characteristics.

Learning Outcomes:

The student will be able to:

1. Understand the meaning and scope of the subject
2. Meaning of geographic regions, major regions of the world.
3. Their political, economic, cultural and physical characteristics of the regions.

Lab

Construction of maps and collection of data, assignment.

Suggested Readings

Pulsipher, L., Pulsipher, A. & Johansson, O. 2020 World Regional Geography: Global Patterns, Local Lives. 8th edition. Macmillan.

Mihelic, P. Lydia. 2005. World Regional Geography: Global Patterns, Local Lives, W.H. Freeman: New York.

Hobbs, J. Joseph and Salter, L. Christopher. 2005. Essentials of World Regional Geography, Brooks Cole Publishing Company: Minnesota.

De Blij, H. J. 2003. Realms, Regions and Concepts, John Wiley: New York.

James, P. E. 1974. One World Divided (Second Edition), John Wiley: New York.

James, P. E. 1955. American Inventory and Prospects, Association of American Geographers: Washington.

Muslim World **Geog: 550** **Credit Hours (2+1)**

Objectives:

The main objectives of this course to provide an extensive knowledge about the Muslim World, its regional differentiation, parameters depend upon regional setup etc.

Learning Outcomes:

The outcome of the course is that students would be capable to understand development of regional thought and themes of Muslim World.

Course Content:

Muslim world as region, Muslim world in the world perspective, diffusion of Islam and expansion of Muslim rule, physiography of the Muslim world, climate of the Muslim world, population: population growth, population distribution, fertility pattern, human resources and development, political systems, disputes and conflicts: national political system, form of government, impacts of colonialism, regional alliances (OIC, ECO, Arab League etc.), Arab-Israel conflicts in the Muslim world, Islamic radial movements, society and culture: foundation of Islamic culture, monastery culture, cultural differences in the Muslim world. Recent Dynamics in Muslim World.

Lab:

Construction of maps to show distribution and pattern of diffusion of Islam, expansion of Muslim rule, physiography, climatic graphs, population distribution, fertility pattern, economic pattern, human resources, colonialism in the Muslim world, major disputes and conflicts.

Suggested Readings:

Pulsipher, L., Pulsipher, A. & Johansson, O. 2020 World Regional Geography: Global Patterns, Local Lives. 8th edition. Macmillan.

Andrew Rippin. 2008. The Islamic World. Routledge. eBook ISBN: 9780203019139

Orens, G. 2003. The Muslim World, H.W. Wilson: New York.

Beaumont, P.G.H. Blake and J.M. Wag staff. 1998. The Middle East, A geographical study, Halsted Press: New York.

Afzal, Iqbal. 1998. Contemporary Muslim world, Kitabistan Publisher: Lahore.

Savory, R.H. 1997. Introduction to Islamic Civilization, Jall & Company: London.

Blake, G.H. and Schofield, R.N. 1987. Boundaries and State territories in the Middle East and North Africa, MENA Press: Cambridge.

7th Semester Compulsory

Field Techniques

Geog: 611

Credit Hours (03)

Objective:

To create awareness among students regarding basics of field techniques.

Learning Outcomes:

By the end of this course, the student will be able to:

1. Understand the approaches in geographic research
2. Identify the overall process of designing a research study from its inception to its report
3. Can able to conduct field survey.
4. Can analyze quantitative and qualitative data.

Course Content:

Meaning and scope of field study, methods of field study: setting of the objectives, search of documentary materials, arrangement of base maps, aerial photographs, satellite imageries, the reconnaissance and formation of field plan, methods of recording direct field observations: fractional code method, unit area method etc., techniques of land use classification: land use classification: land classification of Britain, international geographical union land use classification with special reference to Pakistan, sampling technique and its application in field study: sampling size, sampling type, survey Research: selection of survey mechanism, questionnaire development, survey execution and data analysis, orientation of field instruments: plane

table, leveling, GPS, DGPS, clinometers, field meteorological devices, Scientific documentation through devices, altimeter, digital camera and Photographic Evidences, Survey Ethics

Lab:

Case studies and field visits to understand the techniques of field study, orientation of field instruments.

Suggested Readings:

- Babble, R. 2003. Survey Research methods, John Wiley: New York.
- Chen, Y.Q. and Lee, Y.C. 2001. Geographical Data Acquisition, Springer. USA
- Clifford, N., Cope, M., Gillespie, T. and French, S. 2016. Key Methods in Geography, Sage publications. Ltd., London
- Dixon. 1978. Sampling methods for Geographical research, Nerwick: New York.
- Peacock, H and Holmes, D, (2020) Progress in Field Work Geography Hodder Education: London
- Kalton. 1983. Introduction to Survey Sampling, Sage publication: London.
- Kothari, C. R. and Garg, G. 2015. Research Methodology: Methods and Techniques, New Age International Publishers: New Delhi.
- Lounsbury, Aldrich and F. T. 1986. Introduction to Geographic Field Methods and Techniques, Macmillan Publishing Company: Basingstoke Hampshire.
- Platt, R. 1968. Field Study, Association of American Geographers: New York. 18
- Shiaskin, I.M. 1985. Survey Research, Resource publication, Association of American Geographers: Washington.
- Stoddard, R. H. 1982, Field Techniques and research methods in Geography, New York.

8th Semester Compulsory

**Field Study
Geog: 612
Credit Hours (03)**

Objective:

To create potential to conduct survey and use all available resources for making project and report.

Learning Outcomes:

By the end of this course, the student will be able to:

1. Can able to conduct field survey.
2. Identify the overall process of designing a research study from its inception to its report
3. Can analyze quantitative and qualitative data.
4. Can develop excellent quality maps with all modern softwares.

Course Content:

A course based on extensive field surveys and field documentation and submission of the Final Field Project Report. Students are encouraged to work in group of 3-5 students mainly focused on local geographical issues.

Suggested Readings:

- Sara E. Vero. 2021. Fieldwork Ready: An Introductory Guide to Field Research for Agriculture, Environment, and Soil Scientists. American Society of Agronomy, Inc., Crop Science Society of America, Inc., and Soil Science Society of America, Inc. DOI:10.1002/9780891183761
- Babble, R. 2003. Survey Research methods, John Wiley: New York.
- Shiaskin, I.M. 1985. Survey Research, Resource publication, Association of American Geographers: Washington.
- Kalton. 1983. Introduction to Survey Sampling, Sage publication: London.
- Dixon, C.J. 1978. Sampling methods for Geographical research, Nerwick: New York.
- Platt, R. 1968. Field Study, Association of American Geographers: New York.

7th & 8th Semesters' Optional Courses

Geographical Information Science (GIS)

Geog: 607

Credit Hours (2+1)

Objective:

The course aims to equip students with an understanding of GIS, its evolution and applications of spatial data through Geo-Spatial technologies.

Learning Outcomes:

By the end of this course, the student will be able to:

1. Identify basic components of GIS
2. Differentiate between Raster and Vector models
3. Distinguish between spatial and non-spatial attribute data models
4. Integration of GIS data from Different Sources on identical projections and datum.
5. Develop skills of mapping, visualization and analysis

Course Content:

History and Development, Nature and Scope, Definitions: key components, functional subsystem, Raster data model, vector data model, attribute data model, Data acquisition techniques, data sources, data capturing techniques and procedures, data transformation, visualization of spatial data, layers, projections, Coordinate System and datum, Attribute Data Management, GIS Data Models (Raster, Vector, Attribute), GIS Exploration. GIS Data Sources (Satellites, Air Photos, Drones, Conventional Drawings, & Vector Sources). Map design: symbols to portray points, lines, polygons and volumes, graphic variables, GIS Data Types, visual hierarchy, Data classification graphic approach, mathematical approach. Spatial analysis: neighbourhood functions, network, and overlay analysis, buffering, spatial data quality: components of data quality, micro level components, macro level components, usage components, sources of errors, accuracy and resolution and uncertainty. Raster Data Analysis. Modelling and Project Management in GIS. 3D GIS, GIS Applications

Lab:

Introduction to GIS Lab (hardware/ software), Raster/Vector/Attribute Data Display, Scanning, Digitization, coordinate based point mapping, Raster/ Vector Conversion, Data layer integration and display of different projections, Map layout, Data Classification and Thematic Mapping, Handling of Topological Errors, Overlay and network analysis.

Suggested Readings:

- Ballas, D., Clark, G.H., Franklin, R.S & Newing, A. (2018). GIS and the Social Sciences: Theory and Applications, Routledge publishers, New York USA.
- Bolstad, P. (2018). GIS Fundamentals. Eider Press: Minnesota. 6th Edition.
- Chang, K-T, (2019). Geographic Information System. McGraw-Hill: New York. 9th Edition.
- Comber, L. (2021). Geographical Data Science and Spatial Data Analysis: An Introduction in R. Sage Publishers: London.
- Dadson, S.J. (2017). Statistical Analysis of Geographical Data, Wiley-Blackwell, London.
- Lee, B. & Chmutina, K. (2017). Disaster Risk Reduction for the Built Environment, Wiley & Blackwell publishers, UK.
- Lo, C. P. and Yeung, A. K. W. (2007). Concepts and Techniques of GIS. Prentice-Hall: New Jersey.
- Mar, K. (2018). Research Methods for Environmental Studies: A Social Sciences Approach, Routledge publishers, London U.
- Pine, J. C. (2018). Technology and Emergency Management, Anne Smith, New York USA.
- Rodrigues, J.P. & Slack, B. (2017). Geography of Transport System, Routledge Publisher, London UK.
- Tomlinson, R. (2011). Thinking about GIS: GIS Planning for Managers: ESRI Press. Redlands.

Advanced Quantitative Methods**Geog: 608****Credit Hours (2+1)****Objective:**

To understand students with the knowledge of Quantitative methods (statistics) and its importance. How this subject is useful for understand and quantify geographical problems and social research.

Learning Outcomes:

At the end of the course, students will be able to:

1. Comprehend the concepts of Quantitative Methods.
2. Identify the data type and its calculation.
3. Can draw and plot different tables and graphs.
4. Can use software for data assessment.
5. Know the concept of modeling with data.

Course Content:

This course will focus on geographical uses of statistical methods of spatial analysis, using advanced statistical methods. The course deals with spatial data, spatial statistics;

analysis of spatial distribution, study of spatial association, regionalization, and problems in the analysis of spatial series. Some training in computer programming will also have to be arranged, Multiple and Partial Correlation, multiple regression analysis, multi-variate analysis, exercises on Minitab and SPSS.

Lab:

Application of statistical techniques in geographical research problems.

Suggested Readings:

- Ismay, C. & Kim, A. Y., 2020, Statistical inference via data science, CRC press, USA.
Harris, R., & Jarvis, C. 2014. Statistics for geography and environmental science. Routledge., UK
Wang, Fahui. 2006. Quantitative Methods and Applications in GIS, Chang Wing Publishing: Hong Kong.
O'Brien, L. 2005. Introducing quantitative geography: Measurement, methods and generalised linear models. Routledge., UK
Haining, Robert. 2003. Spatial data analysis: theory & practices, Longman: London.
Peter, R. A. 2001. Statistical methods for geography, Harper & Co: New York.
Shaw, G. and Wheeler, D. 1994. Statistical Techniques in Geographical Analysis, 2nd Edition John Wiley: New York.
Ebdon, D. 1993. Statistics in Geography: A Practical Approach. 2nd Edition, Blackwell Publishing: Cambridge.
Pal, K. S. 1982. Statistical techniques: A basic approach to geography, Tata McGraw-Hill: New Delhi.

Remote Sensing
Geog: 609
Credit Hours (2+1)

Objectives:

1. To introduce knowledge of recording earth's surface features from space-borne platforms and different ways in which images can be analysed.
2. To enable students to develop an understanding of common remote sensing products such as, earth resources satellite images, aerial photographs etc.
3. To develop a comprehension regarding ground-truthing aided by GPS

Learning Outcomes:

By the end of this course, the student will be able to:

1. Have knowledge about the evolution of remote sensing
2. Develop a comprehension of satellite imageries and data extraction
3. Have visual and digital image Interpretation skills
4. Detect land use/land cover changes

Course content:

Nature and Scope: History and Development, Concepts and Foundation of Remote Sensing. Electromagnetic spectrum: Visible Spectrum, Colour Theory, Atmospheric Attenuation. Types of Remote Sensing Systems: Active Remote Sensing, Passive Remote Sensing. Type of Sensors: RBV, MSS, TM,HRV, HRPT/APT/AVHRR, MODIS (Terra and Aqua) non-imaging systems (RADAR). Types of Satellites: Manned Satellites (Gemini, Mercury, Apollo, Space Shuttles), Unmanned Satellites (Metrological, Earth Resources). Telecommunication, Spy, Scientific etc.). Platforms

(Orbits). Ground Receiving Stations (Reception of Data). Image Processing. Image Classification. Image Interpretation: Image Interpretation Methods, Image Interpretation Elements, Image Interpretation Tasks, Image Measurements. Global Positioning System (GPS). Applications (Hydrology, Geology, Climatology, Environmental Application, Planning, Agricultural, Forestry, Socio-economic, Health etc.). Near Remote Sensing (the Drone Technology). Remote Sensing in Pakistan: Potential and Prospects

Lab:

Introduction to labs., single band image interpretation, false color predictions, false color composite images interpretation, visual interpretation of aerial photographs, various sensors data comparison, thermal infrared image interpretation, introduction to ERDAS imagine, ArcGIS Pro, ArcGIS and ArcGIS Online, display, geo-linking, identification of targets, field trips.

Books Recommended:

Aber, J. S., Marzol, f. I., & Ries, J. (2010) Small-Format Aerial Photography: Principles, Techniques and Geoscience Applications, Elsevier, Amsterdam.

Aronoff, S. (2004) Geographic Information Systems, A Management Perspective, WDL Publications, Ottawa.

Bossler, J. D. (Ed.) (2010) Manual of Geospatial Science and Technology, CRC Press Taylor & Francis Group, Boca Raton.

Burrough, P. (2002) Principles of Geographic Information Systems for Land Resources Management. Oxford University Press, Oxford.

Campbell, J. B. & Wynne, R. H. (2011) Introduction to Remote Sensing. Fifth Edition. Guilford Press, New York.

Elachi, C. and Zyl, J. V, (2021). Introduction to the Physics and Techniques of Remote Sensing, Third Edition: John Wiley & Sons, Inc.: New York

Heywood, I., Cornelius, S. & Carver, S. (2003) An introduction to Geographic Information System, Addison Wesley Longman, New York.

Iliffe, J. & Lott, R. (2008) Datums and Map Projections for Remote sensing, GIS, and Surveying . Second Edition. Whittles Publishing, UK.

Jensen, J. (2000) Introductory Remote Sensing: Principles and Concepts, Freeman & Co., New York.

Jensen, J. R. (2018) Remote Sensing of the Environment: An Earth Resource Perspective. Second Edition. Prentice Hall, New Jersey.

Lillesand, T. M., Kiefer, R. W. & Chipman, J. W. (2015) Remote Sensing and Image Interpretation. Seventh Edition. John Wiley and Sons., New Jersey.

Mather, P. M. (2004) Computer Processing of Remotely Sensed Images, John Wiley and Sons, New Jersey.

McDonald, R. & Burrough, P. (2001) Principles of Geographic Information Systems, Oxford University Press, Oxford.

Reddy, M. A. (2008) Textbook of Remote Sensing and Geographical Information System. Third Edition. BS Publications, Hyderabad.

Richard, J. A. & Xiuping, J. (2006) Remote Sensing Digital image Analysis, Springer, Australia.

Sabins, F. F. (2007) Remote Sensing: Principles and Interpretation. Third Edition. Waveland Press, Long Grove, Illinois.
Weng, Q. (2010) Remote Sensing and GIS Integration: Theories, Methods and applications, McGraw Hill, New York.
Wolf, P., DeWitt, B. & Wilkinson, B. (2012) Elements of Photogrammetry with Application in GIS. Fourth Edition. McGraw-Hill, New York.

Political Geography
Geog: 610
Credit Hours (2+1)

Objectives:

To study the political processes and decisions that have given rise to the political division of the world i.e. states and different political systems of the countries and maritime political limits of states.

Learning Outcomes:

The student will be able to understand:

1. Meaning and scope of the political geography
2. Different administrative divisions of the states
3. Resources distribution, maritime boundaries and laws of the sea.
4. Different global political conflicts and possible solutions

Course Content:

Scope and Status of Political Geography, definition: focus on political area, state as the focus of study, main approaches, development of political geography, political-geographic structure of a state, external structure, internal structure, functioning of integrative & divisive forces, measuring the functional effectiveness, geopolitical perspective of the world, heartland, Rim-land: concepts and application, supra-national organizations, role of United Nations in world politics, a case study of Pakistan, boundaries, capital, the hierarchy of administrative units.

Lab:

Study of various attributes of selected states of the world with quantitative cartographer application.

Suggested Readings:

Smith, S. 2020. Political Geography: A Critical Introduction. Wiley-Blackwell
Flint, C. & Taylor, J.P. 2018. Political Geography: World-Economy, Nation-State and Locality. 7th edition. Routledge: London.
Taylor, and P.J. Flint. 2004. Political Geography: World Economy, Nation-State and Locality Pearson: Delhi.
Agnew, J. Mitchell, K., and Toal. 2002. A Companion to Political Geography, Blackwell: Oxford.
Grant R. and Nijman, J. 2002 Globalization and the Margins. Palgrave: London.
Agnew, J. 1997 Political Geography: A Reader, Arnold: London.
Painter, J. Politics. 1995. Geography and Political Geography, Arnold: London.

Taylor, P.J. 1993. Political Geography of the Twentieth Century, Belhaven: London
Raynolds, D. and Knight, D. 1989. Political Geography, Geography in America: Merrill, Columbus (pp. 582 – 618)
Muir, R. 1981. Modern Political Geography: Macmillan: London.
Kasperson, R.E. and Minghi. 1969. The Structure of Political Geography: Aldone, Chicago.
Prescott, J.R.V. (1965). The Geography of Frontiers and Boundaries, Hutchinson: London.

Urban Geography
Geog: 614
Credit Hours (2+1)

Objectives:

The main objectives of this course to provide knowledge and develop skill about the urban characteristics and understanding about urban landscape. The course is designed that students explore city structure, problems, land use and planning.

Learning Outcomes:

The outcome of the course is that students would be capable to identify various urban landscape, cities infrastructure, urban planning and urban land use.

Course Content:

Introduction: Definition of urban area, town, city, metropolitan city, conurbation, megalopolis etc. Location of urban places: site & situation characteristics, Urbanization, city size distribution models, Economic base concept: basic and non-basic functions, central place theory, classification of cities, City Structure and Land use, Classical theories: Concentric Zone theory, Sector theory Multiple Nuclei model, Non-western cities structure, Central Business district, main types of urban land use, Suburbs/urban fringe, Slums/squatters and blighted areas. Urban Population: Clark's model: density-distance relationship and other models ethnic distribution. Urban mobility, Urban Transportation, Urban problems, Urban planning, Urban renewal.

Lab:

Urbanization curves, Population-Density curves and computation, city-size distribution application, urban Land use models application, Land use survey

Suggested Readings:

Hall, T. 2020. Urban Geography, 3rd Edition, Routledge: New York.
Fellmann, D. F. Gatis, and A. Gatis, J. 2018. Human Geography: Landscapes of Human Activities, 8th Edition, McGraw Hill: New York.
Dave, H. K., James, W. O. and Holloway, S. 2017. Urban Geography, John Wiley: New York.
Kaplan, Wheeler, O.J. and Holloway, S. 2003. Urban Geography, John Wiley: New York.
Hartshorne, A. T. and Alexander, W. J. 1988. Economic Geography, 3rd edition, Prentice Hall, Engle wood Cliffs: New Jersey.
David, Clark. 1982. Urban Geography, Croom Helm: London.
Cartar, Harold. 1981. The Study of Urban Geography, Edward Arnold: London.
Ray, M. 1979. Urban Geography, John Wiley: New York.
Murphy, Raymond. 1966. The American city: An urban geography, McGraw Hill: New York.

Mayar, H. and Kohn. 1959. Readings in urban geography, University of Chicago Press: Chicago.

Central Place System
Geog: 615
Credit Hours (2+1)

Objectives:

The main objectives of this course to provide knowledge and develop skill about the urban characteristics and understanding about urban landscape and create link between urban geography and central place system. The course is designed that students explore city central structure, problems, land use and planning.

Learning Outcomes:

The outcome of the course is that students would be capable to identify various urban landscape, cities infrastructure, urban planning and urban land use.

Course Content:

Central place theory, significance and implications; urban hierarchies; intra-urban retail location; models of consumer behavior, application of central place theory in settlements, system of central places; spatial interaction and spatial organization.

Lab

Analysis of central place theory, Comparative field visits of Urban and Rural Central places

Suggested Readings:

- Hall, T. 2020. Urban Geography, 3rd Edition, Routledge: New York.
- Kimberly Etingoff. 2016. Urban Land Use: Community-Based Planning, 1st Edition, Routledge.
- Eiselt, H. A., Marianov, Vladimir (Eds.). 2011. Foundations of Location Analysis, Springer.
- Yupo Chan. 2011. Location Theory and Decision Analysis: Analytics of Spatial Information Technology 2nd ed. 2011 Edition, Springer.
- Fellmann, D. F. Gatis and A. Gatis, J. 2005. Human Geography: Landscapes of Human Activities, 8th Edition, McGraw Hill: New York.
- Hartshorne, A. T. and Alexander, W. J. 1988. Economic Geography, Prentice Hall: Englewood Cliffs, New Jersey.
- Clark, David. 1982. Urban Geography, Croom Helm: London.
- Cartar, Harold. 1981. The Study of Urban Geography, Edward Arnod: London.
- Northern, M. 1979. Urban Geography, John Wiley: New York.
- Murphy, Raymond. 1966. The American city: An urban geography, McGraw Hill: New York.
- Mayar, H. and Kohn. 1959. Readings in urban geography, University of Chicago Press: Chicago.
- Smailes, A.E. 1958. Geography of Town, Hutchinson University: London.

Locational Analysis
Geog: 616
Credit Hours (2+1)

Objectives:

1. This course challenges students with existing skills in data manipulation and analysis using Geographical Information Systems (GIS) to expand their knowledge of locational/spatial information science and GIS procedures.
2. Students will develop and apply advanced data analysis techniques to propose, construct and carry out a major research project in an area of interest.
3. The theoretical foundation of the principles behind GIS analysis are covered in some depth, while practical sessions guide students in the development of increasingly sophisticated spatial analysis capabilities.

Learning Outcomes:

1. After the completion of this course students will be able to:
Understand GIS concepts and locational/spatial analysis techniques in an interdisciplinary setting;
2. Identify and source data for use in evidence-based decision making;
3. Apply ArcGIS for spatial data preparation, analysis and visualization with sophisticated skills of vector and raster processing;
4. Demonstrate proficiency in integrating GIS data analysis with simple statistical analysis;
5. Demonstrate ability to conduct a GIS research project in the area of their choice.

Course Content:

Geographic approach of locational analysis, location and land use decision, agricultural locational theories and their applications, industrial location theories, location decision in urban space, retail location, residential and industrial location, locational analysis of transport network and routes, locational analysis of settlements, methods of locational analysis: location quotient, nearest neighbor analysis, surface analysis, (land value surface, population density surface etc.), Gini coefficient and Lorenz curve, gravity and potential models etc.

Lab:

Computation and analysis of agricultural location theory, industrial location theory, potential model, gravity model, nearest neighbor, Gini coefficient etc. case studies and application of land use models and location theories.

Suggested Readings:

Eiselt, H. A., Marianov, Vladimir (Eds.). 2011. Foundations of Location Analysis, Springer.

Yupo Chan. 2011. Location Theory and Decision Analysis: Analytics of Spatial Information Technology 2nd ed. 2011 Edition, Springer.

Charles, K. and Hall, S. 2004. Locational Models and Theories, Harper & Co: London.

Healey, M and Ilbery. 1992. Location and Change, Oxford University Press: Oxford.

Peter, L. and Dicken.1990. Location in Space: a theoretical approach, Harper & Row: New York.

Haggett, P. 1977. Locational Analysis in Human Geography, Edward Arnold publishing: London.

Chorley, R. Haggett P. 1976. Models in Geography, Methuen & Co: London.

Population Geography

Geog: 619

Credit Hours (2+1)

Objectives:

The main objectives of this course to provide knowledge and develop skill about the population studies, population data enumeration, computation and analysis.

Learning Outcomes:

The outcome of the course is that students would be capable to analyses demographic data of any region and identify the problems related to population growth.

Course Content:

Population geography: Introduction, Sources of population data , Population Growth: Global and regional trends and pattern, Theories of population growth , Population distribution: global pattern and regional pattern , Fertility: measurements, global and regional trend and pattern of fertility , Causes and controlling factors of fertility ,Mortality: measurements, global and regional trend and pattern of mortality , Causes and controlling factors of mortality, Life expectancy and Life table, Population composition: Age-sex composition; Types of Age pyramids, global pattern of aged population., migration: types of migration, causes of migration, Laws of migration, global pattern of migration, Population estimates and Projections

Lab:

Quantitative analysis of population data, geographical presentation of demographic data on maps, demographic survey and compilation of field survey report of any locality.

Suggested Readings:

Peters, L. G. and Larkin, P. R. 2019. Population Geography, 8th Edition, Kendall, Hunt Publishing Company: Iowa.

Raw, M. 2018. Understanding Human Geography: A Practical approach, Bell & Hyman: London.

Jones, R. H. 2, 2015, Population Geography, Harpar& Row: London.

Hammond, W. C. 1979. Elements of Human Geography, 2nd Edition, Bell & Hayman: London.

Clarke, I. J. 1965. Population Geography, Pergamon press: London.

Environmental Geography
Geog:630
Credit Hours (2+1)

Objective:

To impart basic environmental knowledge to the students and enhance their awareness regarding global and local environmental issues.

Learning Outcomes:

By the end of this course, the student will be able to:

1. Explore meaningful relationships between people, places and the environment.
2. Analyze man-environmental interaction.
3. Understand environmental quality standards.
4. Interpret different environmental hazards and their distributions with special reference to Pakistan.

Course Content:

Nature and Scope, Evolution of Environmental Studies in Geography, Comparative Advantage of Geography, Concept of environmental management, Environment and Man: Ecosystem, Resources, Important Cycles, Population explosion, 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, The Climate Change, Major Environmental hazards and Problems in Pakistan: Floods, Smog, 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, UN Conventions (CBD, CCC, CCD).

Lab:

Field visits of urban and rural areas to identify local environmental problems and documentation of these problems through Geo-Spatial Technologies.

Suggested Reading:

Watto M.A., Mitchell M., Akhtar T. (2021) Pakistan's Water Resources: Overview and Challenges. In: Watto M.A., Mitchell M., Bashir S. (eds) Water Resources of Pakistan. World Water Resources, vol 9. Springer, Cham.

https://doi.org/10.1007/978-3-030-65679-9_1

Schelly, C., & Banerjee, A. (Eds.). (2018). *Environmental Policy and the Pursuit of Sustainability*. Routledge, UK.

Handmer, J. (2017). *Ecology, uncertainty and policy: managing ecosystems for sustainability*. Routledge, UK

Harper, C., & Snowden, M. (2017). *Environment and society: Human perspectives on environmental issues*. Taylor & Francis.

Castree, N., & Rhoads, B. (Eds.). (2016). *A companion to environmental geography*. John Wiley & Sons.

- Holden, J. (Ed.). 2005. *An introduction to physical geography and the environment*. Pearson Education.
- Singh, R. B., & Prokop, P. 2016. *Environmental Geography of South Asia*. Springer Japan: Imprint: Springer.
- Botkin, D. B., & Keller, E. A. 2014. *Environmental Science: Earth as a Living Planet*, 9th Edition. John Wiley & Sons.
- Hewitt, K. (2014). *Regions of risk: A geographical introduction to disasters*. Routledge.
- Robbins, P., Hintz, J., & Moore, S. A. (2014). *Environment and society: a critical introduction*. John Wiley & Sons.
- Smith, K. (2013). *Environmental hazards: assessing risk and reducing disaster*. Routledge.
- Saxena, H. M., 2004. *Environmental Geography*. India: Rawat Publications.
- Marsh, W. M., & Grossa Jr, J. 2002. *Environmental geography: science, land use, and earth systems*. John Wiley and Sons.

Environmental Perception and Behavior

Geog: 631

Credit Hours (2+1)

Objective:

To impart basic environmental knowledge to the students and enhance their awareness regarding global and local environmental issues.

Learning Outcomes:

By the end of this course, the student will be able to:

1. Explore meaningful relationships between people, places and the environment.
2. Analyze man-environmental interaction.
3. Understand environmental quality standards.
4. Interpret different environmental hazards and their distributions with special reference to Pakistan.

Course Content:

Introduction; Human sensory perception, Proxemics Studies: Personal and Interpersonal Space Human development, space and place: Children's geographies, Topophilia: Love of Place, Love of Home, Maps in Minds: Cognitive maps, Way-finding and Mental Maps, Experiencing Urban Environments, Hazard Perception: The Urban Environment, Hazard Perception: Adjustment & Risk Perception, Spatial Variations of Environmental attitudes in Pakistan, "Green" Values, Consumerism. and the Environment, Preservation, Restoration, Environmental Values and The Rest of the World: Paradigm Shift.

Lab:

Focus Presentations, Questionnaire based perception survey.

Suggested Readings:

Mira, R. G. 2006. *Environmental Perception and Cognitive Maps*, Psychology Press: New York.

Anthony. 2004. Hope and Despair: How Perceptions of the future shape Human Behavior, The John Hopkins University Press: Washington.

Schwartz, Robert. 2003. Perception, Blackwell Publication: Oxford.

Saarinen, F.T. and Sell, L. James. 1984. Environmental Perception and Behavior: An Inventory and Prospect, The University of Chicago: Chicago.

Ervin, H. Zube. 1984. Environment Evaluation: Perception and public policy, Cambridge University Press: Cambridge.

Ittelson, H. William. 1973. Environment and Cognition, Seminar Press: New York.

Whyte, T.V. A. 1977. Guidelines for Field Studies in Environmental Perception, United Nations Educational, Scientific and Cultural Organization: Paris.

Saarinen, F. Thomas. 1969. Environmental Planning: Perception and Behavior. Houghton Mifflin Company: Boston.

Natural Hazard Management

Geog: 633

Credit Hours (2+1)

Objectives:

Students acquire an understanding of frequently occurring natural disasters.

Learning Outcome:

Students will be able to

1. describe and explain the distribution and causes of tropical cyclones (storms, hurricanes and typhoons), floods, drought, Earthquake, volcanic eruption, Land sliding etc.
2. describe and evaluate the strategies for managing the impacts of natural hazards before, during and after an event
3. describe and explain the opportunities presented by natural hazards to people

Course Content:

Hazard Geography, Introduction to Natural Hazards and Disasters (Concepts & Definitions), Types of Natural Hazard, Nature of occurrence, Location, intensity, Density and frequency, ,type of Disaster, Vulnerability and Risk, Natural Hazards & Disaster Management Cycle: Pre-Disaster Phase (Prevention, Mitigation & Preparedness), Disaster Phase (Response) and Post-Disaster Phase (Rehabilitation, Development), Natural Hazards: causes, distribution pattern, Consequences and mitigation measures, Hydro-Meteorological Hazards: Streams ,Flood and Flash flood, Cyclones(hurricanes), Thunderstorm, Windstorm, Hail, snow hail, Cloud Bursting and Tornados, Drought, Extreme Temperature, Heat, Excessive heat and Cold Wave, Intense cold, Forest Fire ,Mass Movement, Tide waves, Tsunamis/seismic sea wave, Sea Erosion, Coastal Processes and Hazard, smoke volcanic ash, Avalanches, Geo-Hazards: Earthquakes, Volcanoes, Tsunamis, Landslides and Other Down slope Movements(Dry), Glacial Lake, Type of outburst floods. Biological Hazards: Diseases, Transmission of biological hazards, Epidemics and Pandemics, Basic assessment of biological hazards, control exposure to biological hazards Environmental Hazards: Environmental Pollution, Causes, Intensification factor, impact, mitigation and preventive measures for Natural Hazard, Early warning System for Hazard, Risk Assessment, Use of Geo-Information Technologies (GIT) for Natural

Hazard Management, Hazard Vulnerability Assessment & Mapping Case Studies, Natural resources and natural Hazard, Role of Media in Hazard and Disaster Management, Data Availability and Quantifying the natural Hazard, forecasting of Natural Hazard.

Lab

Identification of hydro-meteorological and geo-hazards on satellite data, natural Hazard Vulnerability and risk mapping, Analyzing hurricanes using Tracking Analyst, Use and application of multi-spectral, spatial and temporal remote sensing in flood risk assessment, land sliding susceptibility mapping, seismic hazard mapping, synoptic maps, field visit to the Affected areas, Geo-Information Technologies (GIT) ,Social and perception surveys.

Suggested Readings:

vanMaarseveen, M., Martinez, J., &Flacke, J. 2019. *GIS in sustainable urban planning and management: a global perspective* (p. 364). Taylor & Francis.

Yu, M., Yang, C., & Li, Y. 2018. Big data in natural disaster management: a review. *Geosciences*, 8(5), 165.

Stefan, H. 2006 *Macroeconomic Risk Management Against Natural Disasters: Analysis focused on governments in developing countries*, DUV, ISBN-10: 3835005944

Ansal and Atilla. 2004. *Recent Advances in Earthquake Geotechnical Engineering and Microzonation*, Springer: New York.

Benson, C. and Clay, J. E. 2004 *Understanding the Economic and Financial Impacts of Natural Disasters* World Bank Publications ISBN: 0821356852.

Longley, P., & Batty, M. 2003. *Advanced spatial analysis: the CASA book of GIS*. ESRI, Inc..

Greene, W. R. 2002 *Confronting Catastrophe: A GIS Handbook* ESRI Press ISBN: 1589480406

Coppock, J. T. 1995. GIS and natural hazards: an overview from a GIS perspective. *Geographical information systems in assessing natural hazards*, 21-34.

Bennett, Robert and Estall, Robert. 1991 "Global Change and Challenge: Geography for the 1990", Routledge: London.

Beatley, T., Berke, P. & 1999 *Natural Hazard Mitigation: Recasting Disaster Policy and Planning* Island Press ISBN: 1559636025

Louis, K. Comfort. 1988. *Managing Disasters*, Duke University Press: Durham.

Wijkman, A. and Timberlake, L. 1984. *Natural Disasters, Acts of God or acts of man*,

Petack, William J. and Atkinsson, Arthur A. 1982. *Natural Hazard Risk Assessment and Public Policy: Expecting the unexpected*, Springer-Veriag: New York.

James W. Morentz, Hugh C. Russell, and Judith A. Kelly. 1982. *Practical Mitigation: Strategies for Managing Disaster Prevention and Reduction*, Research Alternatives: Maryland. Harold, D. Foster. 1980. *Disaster Planning: Preservation of Life and Property*, Springer: New York.

Durham. Petack, William J. and Atkinsson, Arthur A. 1982. *Natural Hazard Risk Assessment and Public Policy: Expecting the unexpected*, Springer-Veriag: New York.

Maryland. Harold, D. Foster. 1980. *Disaster Planning: Preservation of Life and Property*, Springer: New York.

Ittelson, H. William. 1973 "Environment and Cognition", Seminar Press: New York.

Agricultural Geography

Geog: 640

Credit Hours (2+1)

Objectives:

1. Examine the spatial distribution of crops, livestock and other agricultural activities.
2. To ascertain the spatial concentration of agricultural phenomena.
3. Experiment different remote sensing tools in the field of agricultural geography.
4. Asses urban and peri-urban regions of cities.

Learning Outcomes:

1. To enable the student to understand the theories and concepts of agricultural geography.
2. To assess all remote sensing and GIS based analysis of agricultural land-use.
3. To prepare the student to be able to interpret and judge the value of data, procedures, methods, and results.

Course Content:

Scope of agricultural geography, origin and diffusion of agricultural geography (theories), determinants of agricultural patterns (physical and non-physical), location of agriculture land use (land use models), crop combination regions, agricultural regions, land classification. Modern agriculture. Food security and insecurities. Climate change and agriculture, Agris: agriculture and remote sensing (Normalized Difference Vegetation Index (NDVI), NDWI, Rainfall Estimates (RFE), Actual Evatranpiration (Eta), Water Requirements Satisfaction Index (WRSI), Monthly reports on global weather hazards and seasonal monitoring by region). Worldwide view of agricultural sector, Urban and Peri-urban agriculture.

Lab:

Software based quantitative analysis of agricultural data, calculations of NDVI, NDWI through ArcGIS, object based analysis of AOI, graphical presentation and preparation of maps based on agricultural data, field survey and compilation of field survey report.

Suggested Readings:

Sara E. Vero. 2021. Fieldwork Ready: An Introductory Guide to Field Research for Agriculture, Environment, and Soil Scientists. American Society of Agronomy, Inc., Crop Science Society of America, Inc., and Soil Science Society of America, Inc. DOI:10.1002/9780891183761

Symons, L. 2019. Agricultural Geography, 1st Edition. Routledge.

Pacione, M. 2013. Progress in Agricultural Geography, Routledge.

Singh, J. and Dhillon, S. S. 2004. Agricultural Geography, 3rd edition, Tata McGraw Hill Publishing Company Limited: New Dehli.

Farooqee, R. 1999. Strategic Reforms for Agricultural Growth in Pakistan, The World Bank Washington D.C.

- Grigg, B. D, March. 1995. An Introduction to Agricultural Geography, 2nd edition, Routledge: London.
- Grigg, David. 1995. Introduction to agricultural geography, 2nd Edition, Routledge: London.
- Hans. 1983. Farming Systems in the Tropics, Ruthenberg Publisher, Oxford University Press: USA.
- James, P.E. 1954. American Geography: Inventory and Prospects, Syracuse University Press: New York.

Geography of Manufacturing

Geog: 642

Credit Hours (2+1)

Objectives:

Introduce the student to the elements and processes of manufacturing geography.

Learning Outcome:

Students will be able to

1. Understand the concepts of production monitoring and control processes.
2. Explain different forms of production logistics in a manufacturing process
3. Compare and contrast different Industrial models/ Theories and material types and their application.

Course Content:

Definition and classification of manufacturing aspects and components of manufacturing geography, evolution of manufacturing activity with reference to socio-political and economic environment, factors of industrial location, approaches to the study of industrial location input factors, land, capital, raw material, energy, labour, enterprise, market, the interaction of supply and demand, input and output market, Pricing policies, infrastructure, transport modes and freight rate structures, social infrastructure, agglomeration and de-agglomeration, public policy and planning, locational inter-dependence, industrial location theories, early geographical approaches, Alfred Weber model, Edgar Hoover, August Losch, Walter Isard, evolution of industrial areas, circular cumulative causation, Industrial area's ageing processes, types of industrial regions, decline and rejuvenation of industrial regions, industrial economy: an international perspective, regional implications of industrial locations, regional development, impact on other economic activities, industries and environment, regional industrial policies, objectives of regional industrial policies, nature of government interventions, impact of industrial and non-industrial government policies on regional industrial development, geographical analysis of selected industries of Pakistan, cotton textile industry, Iron and steel industry, sugar industry, cement industry, methods and techniques in industrial analysis. Concept of Sustainable Development, Environment friendly products (Green Manufacturing).

Lab: Collection and analysis of industrial data, visit of industries.

Suggested Readings:

Mujaddad, H. G., & Ahmad, H. K. 2016. Measuring Efficiency of Manufacturing Industries in Pakistan. *Pakistan Economic and Social Review*, 54(2), 363-384.

Digalwar, A. K., Tagalpallewar, A. R., & Sunnapwar, V. K. 2013. Green manufacturing performance measures: an empirical investigation from Indian manufacturing industries. *Measuring Business Excellence*.

Hartshorne, A. Truman and Alexander, J.W. 1996. *Economic Geography*, Prentice-Hall: New York.

Altaf, Z. 1988. *Entrepreneurship in the third world and uncertainty in industry in Pakistan*, Croom Helm: London.

Keith, Chapman and Walker, David. 1987. *Industrial Location; Principles and policies*, Basil Blackwell: Oxford University press: New York.

Hewing, J.D. 1977. *Regional industrial Analysis and Development*, Methuen and Co: London.

Smith, D. M. 1971. *Industrial Location: An Economic Geographical analysis*, John Wiley: New York.

Alexanderson, Gunnar. 1967. *Geography of Manufacturing*, Prentice-Hall: New York.

Miller, E. Willard. 1962. *Geography of Manufacturing*, Prentice-Hall: Englewood Cliffs.

Biogeography

Geog: 643

Credit Hours (2+1)

Objective:

To understand students with the knowledge of Biogeography. Its importance and scope.

Learning Outcomes:

At the end of the course, students will be able to:

1. Comprehend the Scope of Biogeography and its importance.
2. Know the evolution of subject, physical factors and ecosystem on species distribution, types of Biomes.
3. Understand species role in our life and ecosystem.
4. Aware about the current issues and their impact on species such as climate change, pollution and forest fire.
5. Understand the responsibilities of mankind for conservation and sustainability.
6. Familiar with environmental issues and terms with the subject like Endanger species. Red list of species. Endanger species of Pakistan. Role of conservation and environmental organizations (IUCN, WWF).

Course Content:

Scope of Biogeography, Historical development of Biogeography, Physical limiting factor of species (Temperature, Precipitation, Soil Moisture, Solar radiation, wind), Natural disturbances (Fire, volcanism, floods, hurricanes), Eco-geographical rules, Dendrochronology and its types, function of Ecosystem, Terrestrial Biomes: tropical

rainforest, tropical savannas, deserts, temperate grasslands, boreal forests, tundra, Fresh water Biomes: rivers, lakes, ponds, Marine Biomes: coastal biomes, continental shelf biome, deep sea ecosystem, urban ecosystem. Species extinction and its history. Endanger species. Red list of species. Endanger species of Pakistan. Role of conservation and environmental organizations (IUCN, WWF).

Lab:

Study of terrestrial, marine and freshwater biomes, case studies and field study.

Suggested Readings:

- Huggett, R. J. 2004. Fundamentals of biogeography. Routledge.
Woodward, Susan. 2003. Biomes of Earth, Greenwood Press: London.
Mac, Mahon. 2000. Warm Deserts, Hague Publication, Cambridge University Press: Cambridge.
James H. Brown, Arthur C. Gibson and Mark V. Lomolino. 1998. Biogeography. Sinauer Associates Inc.,U.S. : Sunderland, United States.
Blaxter, J. H., Southward, A. J., Gebruk, A. V., Southward, E. C., & Tyler, P. A. 1997. The biogeography of the oceans. Academic Press.
Briggs, J. C. 1995. Global biogeography. Elsevier.
Tivy, Joy. 1990. Agricultural Ecology, Longman: Eytal.
Sukopp. 1983. Urban environments and vegetation, Junk Publication: London.

Geography of Transportation

Geog: 644

Credit Hours (2+1)

Objectives:

This course will examine the characteristics and operation of transportation systems from several perspectives, including the importance of transportation costs, economic development, public policy considerations, safety, and methodologies related to the analysis of transportation.

Learning Outcomes:

At the end of the course, students will be able to:

1. Understand the performance of transportation systems,
2. Learn Transportation is a key component of economic, social, political, and environmental systems.
3. Can analyze places, regions, and countries develop and interact, and it influences individuals' residence and workplace locations and their access to economic and social opportunities.
4. Can assess The provision of transport infrastructure entails substantial public and private capital expenditures, and its operation is strongly affected by public policy and private decision-making.
5. Can be analyzed using a variety of methodologies through an interdisciplinary approach.

Course Content:

Introduction, framework for the study of transport systems, routes & networks, networks as graphs, network connectivity, network accessibility, density & shape of networks, network density, network shape, prediction of networks, location of routes & networks, minimum-distance networks, deviation from straight line paths, routes & political boundaries, development of transport networks, transport development, improved transport facilitation, communication improvements, cost – space & time – space convergence, transport costs, general properties of transport costs, terminal & line-haul costs, curvilinear & line-haul costs, carrier competition, stepped freight rates, commodity variations in transport, loading and packaging costs, damage & risk variation, shipment size, regularity of movement, special equipment & services, elasticity of demand, freight rate variation & traffic characteristics, intra – city transportation & transport planning, transportation in Pakistan.

Lab:

Preparation of transport maps of Pakistan/world with remote sensing & GIS
Techniques, computing measures of connectivity by different methods, computing network accessibility, route sinuosity etc., with special reference to Karachi/Pakistan.
Field work, submission of assignment and presentation.

Suggested Readings

- David A. H. 2004. Hand Book of Transport Geography & Spatial Systems; Elsevier: London.
- Hoyle, B. and Richard, K. 2004. Modern transport geography, John Wiley: New York.
- Gary, L, Gaile and Cort, J. W.(Eds) 2003. Geography in America at the Dawn of the 21st Century, Oxford University Press: London.
- Miller, H.J. and Shaw, S.A. 2001. Geographic Information Systems for Transportation: Principles & Applications, Oxford University Press: London.
- Rodney, Tolley and Brian, T. 1995. Transport System, Policy & Planning, Longman: London.
- Knapp, B. 1992. Systematic Geography, Collins Educational: London.
- Lolite, H.P. and Senior, M.L. 1989. Transport Geography, Longman: London.
- Robinson, H. 1989. Geography for Business Studies McDonald & Evans: London.
- Robinson, H. & Bainford, C.G. 1978. Transport Geography, Mc.Dnald & Evans: London.
- Kansky, K.J. 1963. Structure of Transportation Networks, Relationship between Network Geometry & Regional Characteristics. Department of Geography, Research Paper No. 84: Chicago: Illinois.
- James E. P and Jones, F. C. (Eds). 1954. American Geography, Inventory & Prospects, Syracuse University Press: New York.

Oceanography
Geog: 646
Credit Hours (2+1)

Objective:

To develop a comprehension of the origin of oceans, geomorphology, circulation and resultant physical and biological characteristics of the oceans and their influence on global climate among the students.

Learning Outcomes:

By the end of this course, the student will be able to:

1. Have knowledge of the nature and scope of the subject.
2. Oceanic Circulation and its influence on the climate
3. Describe the distribution of Sea Surface Temperature, Salinity and density and density zones
4. Comprehend the associated phenomena: Tropical Storms; Tsunami

Course Content:

Scope of oceanography, the origin of ocean basin, ocean topography: Continental Margins and deep Ocean Basins, mid oceanic ridges and sea floor spreading, sea level changes, waves in ocean, circulation of the oceans: surface currents and the Global Ocean Warming: the El Nino and La Nina, Tides, water and ocean structure: global thermostatic effects, the Density Structure of the oceans, Coasts and types of coasts, coasts formed by biological activity: Coral Reefs and their types, mangrove coasts, estuaries: classification, characteristics, their value; lagoons and, marshes marine sedimentation: classification of marine sediments, marine ecology: ocean habitats, the properties of sea water, coastal habitats, biology of the continental shelf and open sea, the oceanic resources: law of the sea, exclusive economic zones, mineral resources, fisheries etc., marine pollution, ocean dredging and mining.

Lab:

Study of chlorophyll contents of oceanic water, study of seawater temperatures, field visits of creeks, estuaries etc. and case studies related to transportation and sedimentation of Indus River sediments, marine ecology, marine resources, marine fishing, marine pollution, mangroves etc.

Suggested Readings:

- Garrison, T. & Ellis, R. 2021. Oceanography: An Invitation to Marine Science. 10th edition. Cengage Learning.
- Sverdrup, A. K. & Kudela, M. R. 2019. Investigating Oceanography. 3rd edition. McGraw Hill Education (UK).
- Pinet, R.P. 2005. Oceanography, Jones and Bartlett publisher: Boston.
- Pirazzoli, A. P. 1996. Sea-Level Changes: The Last 20,000 Years, John Wiley: New York.
- Sunamura, T. 1992. Geomorphology of Rocky Coasts, John Wiley: New York.
- Anderson, R. 1986. Marine Geology, John Wiley: New York.
- Tolmazin, D. 1985. Elements of Dynamic Oceanography, Winchester: UK
- Barnes. 1982. An Introduction to Marine Ecology, Blackwell: Boston.

Ecology of Natural Resources
Geog: 647
Credit Hours (2+1)

Objective:

The main aim of this course is to equip students with knowledge on natural resources, causes, consequences and management of ecosystem changes and environmental degradation.

Learning Outcomes:

By the end of this course, the student will be able to:

1. Understand ecological concepts and principles relevant to management strategies taken to mitigate change in ecosystems.
2. The course instigates in the students the importance of Natural resources management while considering the magnitude of interactions in an ecosystem.
3. Describe and explain causes and impacts of habitat loss describe and explain the need for the sustainable management of forests,

Course Content:

Importance and scope of the study of ecology of natural resources, resources geography. Key Concepts and Hierarchy of ecology and ecological systems (Individual, Population, community, Ecosystems, Landscape, Biomes, Biosphere. Evolution of Ecological Studies in Geography, Studies of natural resources by geographers, Environment, natural and resources, ecology and economic development. Components of ecosystems, Definition, Components (Biotic, Abiotic), Energy flow in the ecosystem, Patterns in ecosystems, Stability and resilience of ecosystems, classification of world ecosystems based on stability and resilience. Threats to natural resources. Man's manipulation of eco-system, Pressure on ecosystems, human impact on natural resources and their exploitation Habitat destruction, Extinction of agricultural land, uncontrolled urban growth, Natural hazards, manifestation of environmental degradation, environmentalist movement, sustainable development Ecological principles in natural resource. Key elements (Time, Species, Place, Human Interventions, The landscape Planning process for management and sustainable development of natural resources. Natural Resource Economics, Natural resource inventory, accounting system (NRAS), ecosystem mapping and modeling, system planning, environmental impact assessment (EIA), Framework of DPSIR model, Incorporation of Sustainable Development Goals, Management strategies to mitigate anthropogenic impacts on natural resources Degradation control, water and soil resources development, prevention of soil depletion, development and conservation issues. Mitigation of Habitat fragmentation, Mitigation of invasive species, Mitigation of diseases and Mitigation of climate change Key issues and problems in Pakistan

Lab: Case studies, field visits, Application of Geoinformatics in Ecology and Natural Resource Management

Suggested Readings:

- Jacques Richard and Alexandre Rambaud, 2021. *Humanitarian Ecological Economics and Accounting: Capitalism, Ecology and Democracy* (Economics and Humanities), Routledge; 1st edition.
- Schelly, C., & Banerjee, A. (Eds.). 2018. *Environmental Policy and the Pursuit of Sustainability*. Routledge.
- Handmer, J. (2017). *Ecology, uncertainty and policy: managing ecosystems for sustainability*. Routledge.
- Harper, C., & Snowden, M. 2017. *Environment and society: Human perspectives on environmental issues*. Taylor & Francis.
- Singh, R. B., & Prokop, P. 2016. *Environmental Geography of South Asia*. Springer Japan: Imprint: Springer.
- Botkin, D. B., & Keller, E. A. 2014. *Environmental Science: Earth as a Living Planet*, 9th Edition. John Wiley & Sons.
- Hewitt, K. (2014). *Regions of risk: A geographical introduction to disasters*. Routledge.
- Robbins, P., Hintz, J., & Moore, S. A. 2014. *Environment and society: a critical introduction*. John Wiley & Sons.
- Ade Asefeso, 2014. *Green Manufacturing: Paradigm Shift to Sustainable Capitalism*. MCIPS MBA
- Smith, K. 2013. *Environmental hazards: assessing risk and reducing disaster*. Routledge.
- Farina, A. 2012. *Landscape ecology in action*. Springer Science & Business Media.
- Keddy, P.A. 2010. *Wetland Ecology. Principles and Conservation*. Cambridge Studies in Ecology, Cambridge University Press, UK.
- Smith, T. M. and Smith, R. L. 2009. *Elements of Ecology*. Seventh Edition. Pearson Education, San Francisco. 649pp.
- US Forest Service and Department of Agriculture 2009. *Threat Characterization and Management Program Charter*. Pacific Northwest Research station.
- Mitsch, W.J., Gosselink, J.G., Zhang, L. & Anderson, C.J. 2009 *Wetland ecosystems*, John
- Maltby, E. & Barker, T. 2009. *The Wetlands Handbook*, Wiley Blackwell, UK.
- Ellis, E. C. and Ramankultry, N. 2008. *Putting People in the Map: Anthropogenic Biomes of the World*. *Frontiers in Ecology and the Environment*, Vol. 6. *Essentials of Conservation Biology*, Sinauer Stanford University, Stanford.
- Headley, T. R. & Kadlec, R. H. 2007. *Conducting hydraulic tracer studies of constructed wetlands: a practical guide* *Ecohydrology & Hydrobiology*, Vol. 7, pp. 269-282.
- Lockwood, M., Worboys, G. L., and Kothari, A. (eds) 2006 *Managing Protected Areas. A Global Guide*. Earthscan, London.
- Batzer, D. P. & Sharitz, R. R. (Eds.) 2006. *Ecology Freshwater and Estuarine Wetlands*. Berkeley, University of California Press, USA.
- Robert, L. S. and Thomas, M. Smith. 2005. *Elements of ecology*, Benjamin Cummings: New Jersey.
- Primack, B. R. 1998. *Essentials of Conservation Biology*, Sinauer Stanford University, Stanford.
- Robert, L. S. and Thomas, M. Smith. 2005. *Elements of ecology*, Benjamin Cummings: New Jersey.
- Primack, B. R. 1998.
- Holden, J. (Ed.). 2005. *An introduction to physical geography and the environment*. Pearson Education.

- Falkenmark, M., & Rockstrom, J. 2005. *Balancing Water for Humans and Nature*. Earthscan, UK.
- Graham, J, Amos, B. and Plumptre, T. 2003. *Governance Principles for Protected Area in the 21st Century*. Paper presented for the Vth IUCN World Parks Congress, Durban, South Africa, Institute of Governance, Ottawa. pp.2-3
- Middleton, N. 2003 *The global Casino: An Introduction to Environmental Issues*. Third Edition. Arnold, London.
- Holecheck, J. L., Cole, R. A., Fisher, J. T. and Valdez, R. 2002 *Natural Resources: Ecology, Economics, and Policy*. Second Edition. Prentice Hall.
- Dale, V.H., Haeuber, R.A., Hobbs, N.T., Huntly, N.J., Naiman, R.J., Riebsame, W.E., Turner, M.G. and Valore, T.J. 2000. *Ecological Society of America White Paper on Ecological Principles and Guidelines for Managing the Use of Land*. www.epa.gov/watertrain/pdf/landuseb.pdf
- Kaplan, D. M., & White, C. G. 2002. *Integrating landscape ecology into natural resource management* (No. 1). Cambridge University Press.
- Richardson, J.L. & Vepraskas, M. J. (Eds.) 2000 *Wetland Soils: genesis, hydrology, landscapes, and classification*, Lewis Scientific Publ., Boca Raton.
- International Institute of Rural Reconstruction (IIRR) 1998. *Sustainable Agriculture Extension Manual for Eastern and Southern Africa*. IIRR, Nairobi. Wiley and Sons, Inc., New York.
- Wackernagel, M. and Rees, W. E. 1998. *Our Ecological Footprint: Reducing Human Impact on the Earth*. New Society Publishers, Gabriola Island, BC, Canada.
- Whatmore, S. 2002 *Hybrid Geographies*. Routledge, London.
- Strahler, N. Arthur and Strahler, A. H. 1987. *Modern Physical Geography*, 3rd Edition, John Wiley: New York.
- Strahler, N. Arthur and Strahler, A. H. 1987. *Modern Physical Geography*, 3rd Edition, John Wiley: New York.
- I. G. Simmons, (1981) *Ecology of Natural Resources*. Halsted Pr; Subsequent edition.
- John, A. Dawson and John C. Doornkamp. , 1973. *Evaluating the human environment*, Edward Arnold: London
- John, A. Dawson and John C. Doornkamp. , 1973. *Evaluating the human environment*, Edward Arnold: London.

Coastal Morphology
Geog: 651
Credit Hours (2+1)

Objective:

To develop a comprehension of the origin of oceans, geomorphology, circulation and resultant physical characteristics of the oceans among the students.

Learning Outcomes:

By the end of this course, the student will be able to:

1. Get the knowledge of the nature and scope of the subject.
2. Describe the distribution of sea/ocean sea surface temperatures, salinity and oceanic circulation.
3. Comprehend the associated phenomena: Tropical storms; Tsunami.

Study of shoreline, morphology of coastal areas, classification of coasts, evolution, effects of change of sea level. Tide and its effects on the coast, Human activities and Morphological Changes Waves and shallow water transformation, Infragravity, far infragravity waves, Near shore currents, Sediment transport processes and bed form, Beach and barrier, Morpho-dynamics, Muddy coast, Deltas & Estuaries,

Lab:

Study of coastal features of Pakistan.

Suggested Readings

- Anthony, N. and Procopio. 2006. An evaluation of landscapes, hydrology, and channel morphology of coastal plain drainages with different cranberry agriculture histories, ProQuest Information and Learning: Ann Arbor.
- Ritter, Kochel and Miller. 2002. Process Geomorphology, John Wiley: New York.
- Andrew, Miller. 1999. Varieties of Fluvial forms, John Wiley: New York
- Pirazzoli, A. P. 1996. Sea-Level Changes: The Last 20,000 Years, John Wiley: New York.
- Sunamura, T. 1992. Geomorphology of Rocky Coasts, John Wiley: New York.
- Nordstrom, F. K. Psuty, N. and Carter, B. 1991. Coastal Dunes: Form and Process, John Wiley: New York.
- Thornbury, W.E. 1991. Principles of Geomorphology, John Wiley: New York.
- Guilcher, A. 1988. Coral Reef Geomorphology: Coastal Morphology and Research John Wiley: New York.

Applied Climatology
Geog: 652
Credit Hours (2+1)

Objectives:

To examines the effects of climate on physical, biological and cultural environments.

Learning Outcomes:

By the end of the course student will be able to;

1. World regional patterns of natural vegetation
2. Can understand factors affective climate
3. Can understand all the carbon footprints

Course Content:

Climatic classification: leads to regional pattern of natural vegetation human activities civilization, climatic impact (natural): weathering, soil formation, erosion, floods, drought, brushfires, Climate & Water resources: water cycle, Rainfall, melting of ice, rivers, annual water budget of a place, Water as: Soil re-charge (flood), as devastator (flood), miss-use leeching salinity & Water logging, Rainfall and river discharge studies: flood forecasting (catchments area and runoff, soil moisture level), Agricultural climatology: Rainfall, temperature, wind, sunshine, Ago-climatic regions of Pakistan crop climate calendar, Agricultural hazard, Climate and human living (comfort, discomfort) climate & housing, Air conditioning, Climate and public safety: Air-

pollution, dust storm, thunderstorm, lightening hazards, Transport-fog, road icing, mudslides, snow avalanche, Aviation hazard, brush fires, cyclonic storm, tornados, swamps, breeding of mosquitoes, climate & Human activities relating to long term changes in climate, Carbon dioxide & ozone depletion leading to climate change, deforestation, over irrigation, desertification, Climate of cities: heat islands, areas of maximization of rainfall, climate and renewable energy resources.

Lab.

Weather map interpretation related to climate, Climo-graphs, climate classification of a station comfort index by month of a climatic station, discuss your house design from climate view/out relate crops of a district (Rabi & Kharif) of Sindh/Punjab, Study climate normal of 1911-40, 1931-60, 1961-90 to search for climatic change if any over Pakistan.

Suggested Readings:

- Thompson, D. R. and Perry, A. 2005. Applied Climatology, 1st Edition, Taylor and Francis: London.
- Barry, G. R. 2001. Synoptic and Dynamic Climatology, 1st Edition, Routledge: New York.
- Strahler, A.N. 1992. Modern Physical Geography, John Wiley: New York.
- Hobbs, E. J. 1980. Applied Climatology: A study of atmospheric resources, Westview Press: San Francisco.
- Berry, B.J.L. and Chorley, R. 1971. Atmosphere, Weather, Climate, Methuen: London.
- Trewartha, G.T. and Finch, J. 1967. Physical Elements of Geography, McGraw Hill: New York.
- Trewartha, G.T. 1954. An Introduction to Climate, McGraw Hill: New York.

Plant Geography Geog: 653 Credit Hours (2+1)

Objectives:

Major objective of this course is to develop understanding about the global distribution of plants specifically with reference to Pakistan.

Learning outcomes:

After completion of this course students able to learn the characteristics of plants and how multiple ecosystems behave with native and exotic floral species

Course Content:

Meaning and scope of plant geography, History of plant geography, Floristic composition, Plant habitat, plant dispersal and migration, Ecological zones for plant diversity, tropical rainforests, tropical dry forests, mangrove, desert vegetation, temperate grasslands, temperate broadleaf forests, boreal forests, tundra, History and distribution of Flora of Pakistan (Main regions) and Flora of Karachi,

Lab:

Study of various groups of plants and their dispersal, field visits and case studies. Access digitally available global data on plant diversity and distribution for research purpose, Usage of different web based software for plant identification. Create maps for existing flora of any region of Pakistan.

Suggested Readings:

- Reppir, Z. 2021, Plant Geography and Ecology, Westbury publishing Ltd., UK.
Stott, P., 2021, Historical Plant Geography, Routledge, UK
Hardy, M. E., 2018, An Introduction to Plant Geography, Franklin Classics Trade Press, USA
Singh, J. and Dhillon, S. S., 2004, Agricultural Geography, 3rd edition, Tata McGraw Hill Publishing Company Limited: New Dehli.
Woodward, S., 2003, Biomes of Earth, Greenwood Press: London.
Farooqee, R., 1999. Strategic Reforms for Agricultural Growth in Pakistan, The World Bank Washington D.C.
Hans, Ruthenberg., 1983. Farming Systems in the Tropics, Oxford University Press: Oxford.
Daubenmire, R., 1978, Plant Geography, Academic press, USA
Gleason and Cronquist. 1968. The Natural Geography of Plants, Columbia University Press: Colombia.
Cain, A. S. 1944. Foundation of Plant Geography: London.

Rural Development & Change

Geog: 657

Credit Hours (2+1)

Objectives:

The main objectives of this course to provide knowledge and develop skill about the rural characteristics and understanding rural landscape. The course is designed that students explore issues of rural development and planning.

Learning Outcomes:

The outcome of the course is that students would be capable to identify problems of various rural settlements and techniques of rural planning and development.

Course Content:

Rural geography, nature and scope; approaches of study, resource-based economic approach, community-oriented social relations approach, land use based spatial approach, evolution in rural development practices, past and current emphases, institutional framework and mechanism for development of rural areas and communities,, rural population, characteristics of rural population, occupational structure, social differentiation, rural settlements, types of rural settlements, morphological and internal patterns of rural settlements, relationship of rural settlements with resources , nature and delivery of services to rural communities, rural problems, issues in rural development, planning and mechanism for rural development, community oriented development and the role of government and non-governmental organizations.

Lab:

Field survey of different categories of rural community and exercises involving analysis of data.

Suggested Readings:

- Woods, Michael. 2015. Rural Geography, Sage publication: London.
Delad, B. Clayton, Daut, David and Dubois, O. 20013. Rural Planning in Developing Countries: Supporting natural resources management and sustainable livelihoods, Earth scan publications limited: London.
Butler, R. 1998. Rural recreation and tourism, Longman: London.
Sulramaniam, S.R. 1987. Readings in integrated rural development, IBH Publishing co, pvt. ltd.: New Delhi.
Devi, Laxmi. 1996. Encyclopedia of Rural Development, policies, method, stalequies in rural development, institute of sustainable development: luchknow.
Pacione and Michael. 1984. Rural Geography: Integrated rural development, Harper & Raw Ltd.: London.
Clout, H.D. 1972. Rural Geography, Oxford University Press: Oxford.

Migration and Regional Development

Geog: 658

Credit Hours (2+1)

Objectives:

The main objectives of this course to provide knowledge and develop skill about the fuissues of migration, its causes and impacts, issues of refugee problems, illegal immigrants and Internal displaced persons

Learning Outcomes:

The outcome of the course is that students would be able to analyze migration issues and problems and suggest measures to overcome migration problem.

Course Content:

Defining and conceptualizing migration and its types and reasons, levels and trends of migration theories of migration, impact of migration on regional development and relationship between human mobility and change in global economy, migration and poverty, mobility and health, migration and gender, migration policies: Internal Displaced Persons: causes and consequences.

Lab:

Quantitative analysis of migration data, field work and report presentation

Suggested Readings:

- Kothari, Uma. 2020. Migration and chain Poverty, Institute of Development Policy and Management. University of Manchester: Manchester.
Martin, P. and J. Widgrn. 2012. Population Bulletin, Vol. 57, No.1. Population Reference Bureau: Washington D.C.
Davies, Suzanne and Pandit, Kavita. 1999. Migration and Restructuring in the USA: A Geographic Perspective, Rowman and Littlefield: Colorado.

Hammond, W. C. 1979. Elements of Human Geography, 2nd Edition, Bell & Hayman: London.

Geography of Recreation & Tourism

Geog: 660

Credit Hours (2+1)

Objectives:

1. To evaluate spatial design of recreational activities; geography and tourism; impacts of geography on tourism. impacts of tourism on geography.
2. To evaluate Eco- tourism and Geo-Spatial analyses.

Learning Outcomes:

1. Will be able to describe the tourism geography and cognitive framework related to the tourism geography and will be able to explain the importance of strategy and planning to improving sustainable tourism.
2. Will be able to evaluate the natural geographic resources, and evaluate the human and cultural geographic resources.
3. Explains the efficient factors of improving on urban tourism.
4. explain the international tourism transportation and tourist flow.
5. Will be able to recognize the tourism regions of the world.

Course Content:

Introduction and Significance of recreation and tourism, Geographic concepts, Foundation of tourism, History of tourism, Tourists places, Tourism networks, Cultures of Tourism, tourist's natures, Eco-tourism, the tourism industry, tourism economy, the politics of tourism, the power of tourism, planning and policy for recreation and tourism, the demand for recreation: measurement of demand, perception in outdoor recreation: theories, recreation as a social force, tourism: its motivation & impact, outdoor recreation & the environment, basic components of tourism, planning for tourism, marketing of tourism, transport and tourism, International flow of tourism and changing trends in world tourism, tourism in Pakistan –problems & prospects.

Lab:

Preparation of tourist guide maps of Pakistan/world with remote sensing & GIS techniques, field work based on questionnaire survey of different places of tourist interest in Sindh/Karachi & submission of assignment and presentation, questionnaire survey of recreational areas in Karachi; submission of assignment & presentation.

Suggested Readings:

Mallen, C., Adams, J. L. 2017. Event Management in Sport, Recreation and Tourism: Theoretical and Practical Dimensions, Routledge.

Tribe, J. 2015. The Economics of Recreation, Leisure and Tourism, Routledge.

C.M. Hall & S.T. 2004. Tourism in S. Asia, Routledge: New York.

Jorgen, O. Baerenholdt, Haldrug, M. Larsen, J. And Urry, J. 2004. Performing Tourist Places, Ashgate Publicaton Co: London.

David, A. Fennel. 2004. Ecotourism: An Introduction, Roughtledge: New York.

Hall, C.M. and Page, S.J. 2003. The Geography of Tourism and Recreation, Routledge: New York.

Lloyd, Hudman, Richard, H. and Tacksan. 2003. Geography of Travel & Tourism, Deelmar: London.

- Patrick, Lavery. 1999. Introduction to Travel & Tourism Recreational Geography, Longman: New York.
- Wahab, Salah and Pigram, J. I. 1997. Tourism Development & Growth, Routledge: New York.
- Cooper, C.P. 1989. Progress in Tourism, Recreation and Hospitality Management, Pinter Publish: New York.
- Pigram, John. 1980. Outdoor Recreation & Resource management, Routledge: New York.
- James, P. E. and Clarence, F. Jones. 1954. American Geography Inventory and Prospects, Association of American Geographers: Syracuse.

Metropolitan Transportation

Geog: 665

Credit Hours (2+1)

Objectives:

This course will examine the characteristics and operation of transportation systems from several perspectives, including the importance of transportation costs, economic development, public policy considerations, safety, and methodologies related to the analysis of transportation.

Learning Outcomes:

At the end of the course, students will be able to:

1. Understand the performance of transportation systems,
2. Learn Transportation is a key component of economic, social, political, and environmental systems.
3. Can analyze places, regions, and countries develop and interact, and it influences individuals' residence and workplace locations and their access to economic and social opportunities.
4. Can assess The provision of transport infrastructure entails substantial public and private capital expenditures, and its operation is strongly affected by public policy and private decision-making.
5. Can be analyzed using a variety of methodologies through an interdisciplinary approach.

Course Content:

Accessibility, land use, and social implications of urban transportation, relationship between urban and use and transportation, accessibility and urban dwellers, urban transportation systems, network, modes, flow, inventory, system operation, modes of urban transport: patterns and related issues, road transport, rail transport, water transport; ports, air transport, urban transportation modal system (UTMS), trip generation, trip distribution, modal split, route or network assignment, metropolitan transportation planning process, models, problem solving process, transportation planning Process, transportation problems, identification and classification of problems, problem hierarchy, transport service problems, problems created by transportation, environmental problems, land use/land values, social problems, infrastructure problems, transportation goals and objectives, basic urban values and goals, goals for transportation, alternate solutions to transport problems, transportation

and technologies, transport solutions to transport problems, non-transport solutions to transport problems, metropolitan transportation in Pakistan, main issues related to metropolitan transportation in Pakistan, metropolitan transportation of Karachi; problems and alternate planning strategies, transportation data and techniques of analysis, problems with transport information, geocoding, land use inventory, travel facilities inventory, O-D survey, application of GIS and remote sensing in transportation analysis and planning.

Lab:

Field surveys/study of various problems using statistical methods.

Suggested Readings:

Katz, B. and Puentes, R. 2005. Taking the High Road: A Metropolitan Agenda for Transportation Reform,

Brookings Institution Press: Washington.

Middleton, D.W. 2003. Metropolitan Railways: Rapid transit in America, Indiana University Press: Bloomington.

Taaffe, E.J. 1996. Geography of Transport, Second Edition Prentice Hall: New Jersey.

Quddus, Abdul, Syed. 1987. Pattern of Transport in Pakistan, Islamic Book Centre: Lahore.

Rakowski, James, P.E. 1976. Transportation Economics, Gale Research Company: Michigan.

John, W. Dickey. 1975. Metropolitan Transportation Planning, McGraw Hill: New York.

Hurst, M.E.E. 1974. Transportation Geography, McGraw Hill: New York.

Murphy, R.E. 1966. The American City, McGraw Hill: New York.

Regional Development and Planning

Geog: 666

Credit Hours (2+1)

Objectives:

1. The aim of the course is to enable students to develop a broad understanding of the knowledge, skills and values relevant to spatial planning and sustainable development, and an ability to apply these to professional practice.
2. It aims to equip students with the understanding and skills to enter a career involving the management of the spatial dimension of social, economic, technological, environmental and political changes.
3. The course examines planning in both urban and rural areas, but the emphasis is on urban planning. The course aims also to provide students with the opportunities to explore ideas, perspectives and debates to a considerable degree of depth in one distinct area of planning.

Learning Outcomes:

1. To enable the student to interpret, translate, and extrapolate basic concepts, principles, and theories associated with the Land Use Planning.
2. To enable students to be competent at researching and compiling information on relevant subjects, and to apply critical thinking to the application of this information.

3. To prepare the student to put into practice, in a real-life situation, the knowledge and skills of the profession.
4. To prepare the student to be able to interpret and judge the value of data, procedures, methods, and results.

Course Content:

Introduction to regional planning, need for regional planning; inter and intra-regional planning; elements, objectives and current ideas in planning; evolution of planning theory, regional concept, concept of a region types of regions, identification and differentiation of administrative, planning and special purpose regions, qualities and problems of a planning region, regional systems and hierarchy, delimitation techniques; relationship between regional and national planning, planning theories, theories in planning, regional growth, locational and economic growth theories, planning information, basic surveys: land-use, demographic socio-economic, transportation and infrastructure; the role of data in plan preparation and relative problems associated with data collection, the planning process, preparation of regional plans, integrated area plan, sectoral plan, local plan, their contents, preparation, programming and presentation, some complex issues in planning process; uncertainty in planning, elements and factors in regional planning, organizations, public participation and political implications, spatial imbalances of economic health, rich and poor areas, recognition and mapping of regional inequalities, basic needs, planning for energy, water supply, health, education, agriculture, transport etc., a comparative study of area development, policies/regional planning in Pakistan and other countries of the world, especially France and Britain, a critical appraisal of regional planning in Pakistan, major challenges, information gap; technology to suit local needs, social welfare and mobilization of masses.

Lab:

Preparation of maps of different regions from satellite imageries use of GPS and GIS, demarcation of planning regions based on primary and secondary data, demarcation of planning regions based on statistical methods and use of relevant computer soft wares, preparation of assignment and presentation.

Suggested Readings:

- Jiwani, J. 2020. Regional Development and Planning, Rawat Publications.
- Healey, Patsy. 2006. Collaborative Planning, Shaping Places in Fragmented Societies, MacMillan: New York.
- Altrack, U. Guntner S. Sandre, Hunning and Peters, D. 2006. Spatial Planning and Urban Development in the New EU Member States, from adjustment to rejuvenation Ash Gate Pub. Ltd.: New York.
- Richard, T. and Gates, Le. 2005. Thinking Globally, Acting Regionally, GIS and Data Visualization for social science and public policy research, ESRI: Washington.
- Stephen, M. Wheeler. 2004. Planning for sustainability, Towards more live able and ecological communities, Tayler & Franccs Publication: New York.
- Harvey, W. Armstrong. 2000. Regional Economics and Policy, Blackwell Publication: London.
- Conyers, Diana, Hills and Peter. 1991. An Introduction to Development Planning in the Third World, John Wiley: New York.
- Paul, J. Clock. 1983. An Introduction to Rural Settlement Planning, Methmen: London.

- Cheema, S. Shabbir. 1981. Institutional Dimension of Regional Development in Asia: Singapore.
- Lassey, William. R. 1977. Planning in Rural Environment, McGraw Hill: USA.
- Falaudi, A. 1977. A Reader in Planning Theory, Pergamon: London.
- Peter, Hall. 1976. Urban and Regional Planning, Charles Newton Abbot Pub: London.
- Stanley, D. Brunn. 1975. Cities of the world, world regional urban development, Harper Row Pub: New York.

Fluvial Geomorphology
Geog: 667
Credit Hours (2+1)

Objectives:

1. Determine the processes determine the form and evolution of rivers and streams.
2. Infer process from form and vice versa?
3. understand the form and process vary spatially and temporally?
4. apply knowledge about fluvial geomorphic processes to river restoration and management?

Learning Outcomes:

Student will have the opportunity to:

1. gain a strong understanding of river channel processes and of the linkages between river channel form and process
2. acquire fundamental knowledge about fluvial geomorphic processes needed to manage and restore rivers
3. communicate an understanding of the interrelationships among fluvial geomorphic concepts and theories to peers and others
4. use models, data, and logical reasoning to critically evaluate and connect information about river processes
5. interpret and analyze literature about fluvial geomorphology from both secondary and primary sources
6. improve your capacity to work as a member of a productive, collaborative team
7. gain experience collecting and analyzing field data
8. improve writing skills.

Course Content:

Scope of fluvial geomorphology, the river channel: process of valley development, classification of valley, drainage pattern and drainage texture, channel sediments: transportation, bank erosion, deposition, & the frequency and magnitude of river work, hydraulic geometry, the influence of slope, channel shape, channel pattern, river rejuvenation process, river piracy, river terraces and their significance, alluvial deposits and alluvial landforms, development of flood plain and types, alluvial fans and bajadas, river deltas: formation and types, case studies.

Lab:

Field study trips to study fluvial process and land forms, analysis of drainage surface, computational analysis of channel geometry, channel discharge.

Suggested Readings:

- Schaetzl, R. J. and Anderson, S. 2005. Soils: Genesis and Geomorphology, Cambridge University Press: Cambridge.
- Thornbury, W.E. 2002. Principle of Geomorphology, John Wiley: New York.
- Ritter, Kochel, Miller. 2002. Process Geomorphology, John Wiley: New York.
- Ritter, Kochel and Miller. 2001. Process Geomorphology, John Wiley: New York.
- Andrew, Miller. 1999. Varieties of Fluvial forms, John Wiley: New York.
- Thornbury, W.E. 1991. Principles of Geomorphology, John Wiley: New York.

Urban Land Use & Planning

Geog: 668

Credit Hours (2+1)

Objectives:

1. Achieve a fundamental understanding of land use planning theories and practices, including planning history, an understanding of development patterns and their primary determinants, and land use regulations and planning tools. Acquire an advanced understanding of the land use history and development patterns.
2. Acquire conceptual and experiential training in land use planning theory and practice.
3. Understand land use planning tools and methodologies.
4. Understand development alternatives.
5. Be able to thoroughly research a professional issue, evaluate and compile relevant data and information on the issue, and present their findings and conclusions in a well-organized, professional fashion.

Learning Outcomes:

1. To enable the student to interpret, translate, and extrapolate basic concepts, principles, and theories associated with the Land Use Planning.
2. To enable students to be competent at researching and compiling information on relevant subjects, and to apply critical thinking to the application of this information.
3. To prepare the student to put into practice, in a real-life situation, the knowledge and skills of the profession.
4. To prepare the student to be able to interpret and judge the value of data, procedures, methods, and results.

Course Content:

Introduction: definition, history. Urban Sprawl. Land has value by way of rent, use & misuse of land, factors influencing land use: people: stage of technological development, cultural compulsions, density distribution, site, city structure: classical models: concentric zone theory, sector theory, multinuclear, - central Business district, central city, suburb – western and non-western situation, land value/rental value, accessibility, centripetal & centrifugal forces, historical legacies, cultural factors, land

use categories & their representation on a land use map plan, residential, commercial, industrial, institutional, office, assembly, open spaces, vacant land (use unspecified). Land based classification standards on the bases of activity, function, structure, site, ownership. land use planning, neighborhood unit concept, garden city concept, ekistics approach, study of city plan of Hyderabad, Islamabad & Karachi, zoning laws, city planning, relocation of land use, urban re-development. Land-use planning strategies: transit orient design, mixed used development, urban growth boundaries, infill development, greenways, brownfield redevelopment, transfer of development rights, open space protection, urban forestry, land trusts, agricultural land protection and solar access protection. Urban planning procedures: rational planning, synoptic planning, participatory planning, mixed scanning models, advocacy planning, bargaining models and communicative approach. Urban planning aspects: Aesthetics, Safety and security, Infrastructure, Environmental factors, Green Spaces, Transport, Slums, Decay, and Reconstruction and Renewal. New Master Planned Cities and Scope of Zone Act. Future of cities.

Lab: Field visit of downtown, core areas and urban peripheries of Karachi. Project & Report work.

Suggested Readings:

John M. Levy. 2016. Contemporary Urban Planning, 11th Edition, Routledge.
 Kimberly Etingoff. 2016. Urban Land Use: Community-Based Planning, 1st Edition, Routledge.
 Philip R. Berke, and David R Godschalk. 2006. Urban Land Use Planning, Fifth Edition 5th ed. Edition, University of Illinois Press.
 Herbert, T. D. and Thomas, J. C. 2005. Cities in space: City as Place, 3rd Edition, David Fulton Publishers: London.
 Freire, M. and Belinda, Y. P. K. 2004. Enhancing Urban Management in East Asia: Urban and Regional Planning and Development, Ashgate: Burlington
 Hall, P. 2002. Urban and Regional Planning, 4th Edition, Routledge: London.
 Laurini, R. 2001. Information Systems for Urban Planning, CRC: London.
 Davies, K. W. and Herbert, D.T. 1993. Communities with in Cities: An Urban Social Geography, Bellhaven Press: New York.
 Herbert, D. and Thomas, J. C. 1982. Urban Geography, John Wiley: New York.
 Herbert, T. D and Thomas, J. C. 1982. Urban Geography, John Wiley: New York.
 Northam, M. R. 1975. Urban Geography, John Wiley: New York.
 Herbert, D. 1972. Urban Geography, David & Charles: Newton Abbot.
 Johnson, J. 1968. Urban Geography, Elsevier Science Publishing Co: Atlanta.
 Murphy, E. R. 1966. The American city: An urban geography, McGraw-Hill: New York.

Management of Water Resources

Geog: 673

Credit Hours (2+1)

Objectives:

To acquaint the students with principles and processes governing the movement of water through the hydrologic cycle, hydrograph, hydrologic statistics, frequency and water quality analysis techniques.

Learning Outcome:

Students will be able to Describe

the distribution of the Earth's water, interpret the water cycle, compare the availability of safe drinking water (potable water) in different parts of the world, describe and evaluate multipurpose dam projects, Sources and explain the impact of pollution of fresh water on people and on the environment, explain strategies for improving water quality

Evaluate the need of quantitative and qualitative assessment of water resources for better Socio-economic and environmental growth at local and National scale.

Course Content:

Sources of fresh water, problems of fresh water resources, methods and techniques of water management, Degradation of soils and ground water, causes, effects and solution of Hydro-meteorological hazards (Floods, Drought). Watershed delineation and management of water resources in agriculture, Industrial and domestic sectors. The water economy; Desalination and recycling, Provision of safe potable water; threats to water quantity and quality in urban areas. International and National water conflict, security, and climate change. Water laws and policy; institutions for water management at the global, national, regional, and local scale. Incorporation of Sustainable Development Goals.

Lab:

Application of Remote sensing and GIS in water resources management in monitoring and mapping water related real world issues, Field visits, sample collection, physical parameter testing (PH, TDS, EC)

Suggested Readings:

Ahmed, K., Watto, M. A., Shahid, S., Nawaz, N., & Khan, N. (2021). Spatial Variability of Groundwater Storage in Pakistan. *Water Resources of Pakistan: Issues and Impacts*, 9, 209.

Muhammad Arif Watto. (2021) Water Resources of Pakistan: Issues and Impacts (World Water Resources, 9) 1st ed. 2021 Edition Springer; 1st ed. 2021 edition (March 26, 2021)

Jamil, M. (2019). *Running Dry: Water Scarcity in Pakistan*. Naval Postgraduate School Monterey United States.

Stucker, D., & López-Gunn, E. (Eds.). (2014). *Adaptation to climate change through water resources management: Capacity, equity and sustainability*. Routledge.

Manish Dubey, (2009). Agriculture and Water Management. Cyber Tech Publications: India.

Lackey, R.T. (2005). Economic growth and salmon recovery: an irreconcilable conflict? *Fisheries* 30 (3): 3032.

Falkenmark, M., & Rockstrom, J. (2005) *Balancing Water for Humans and Nature*. Earthscan, UK.

McRae, D. M. and Pearse, P. H. (2004). *Treaties and transition: towards a sustainable fishery on Canada's Pacific Coast*, Federal-Provincial Joint Task Group Report: 58pp.

- Mays, W. L. (2004). *Water Resource Systems Management Tools*, 1st Edition, McGraw-Hill: New York.
- Jain, K. S. and Singh P. V. (2003). *Water Resources Systems Planning and Management*, 1st Edition, Elsevier Science: New York.
- Karamouz, M. Szidarovszky, F. and Zahraie, B. (2003). *Water Resources Systems Analysis*, CRC: London.
- Lyon, G. J. (2002). *GIS for Watershed and Water Resource Management*, CRC: London.
- Hancock, G. R., Martinez, C., Evans, K. G., & Moliere, D. R. (2006). A comparison of SRTM and high-resolution digital elevation models and their use in catchment geomorphology and hydrology: Australian examples. *Earth Surface Processes and Landforms: The Journal of the British Geomorphological Research Group*, 31(11), 1394-1412.
- Pauly, D, V. Christensen, S. Guénette, T. Pritcher, U. Sumaila, C. Walters, R. Watson, and D. Zeller. (2002). Towards Sustainability in World Fisheries, *Nature* 418, 8 August, pages 689 – 695.

Disease Ecology and diffusion of diseases

Geog: 674

Credit Hours (2+1)

Objectives:

Objective of this course is to study the Diseases prevailed in the environment and how they diffuse globally.

Learning Outcomes:

After completion of this course students are aware the branch of medical geography especially deal with the diseases. Global pattern of diffusion of diseases and its incidence in Pakistan.

Introduction to Medical Geography, The Human Ecology of disease, Landscape Epidemiology, Developmental change and human health, the Biometeorology of health status, Geographies of disease in economically developed and under developed areas, Communicable and non-communicable diseases, diseases, diffusion in space, health care delivery systems worldwide, distribution of health care resources, accessibility, utilization and health service planning, data, measures and methodologies, scale, spatial analysis and geographic visualization through GIS technology, Diseases incidence and diffusion of diseases in Pakistan.

Lab:

Identification of disease cluster places, making maps for Ecological parameters of different diseases of world, Disease incidence maps, prevalence pattern of different diseases, and identification of habitat development on satellite data.

Suggested Readings:

Ruiz, M.O., 2020, *Geography of Disease*, Oxford University Press, USA.

Adams, D. P. 2020, *Foundations of Infectious Disease: A Public Health Perspective: A Public Health Perspective*, Jones & Bartlett Learning, USA

- Ostfeld, R. S., Keesing, F. & Eviner, V. T. 2008, *Infectious Disease Ecology: Effects of Ecosystems on Disease on Ecosystems*, Princeton University Press, USA.
- Koch, T. 2005. *Cartographies of Diseases: Maps, Mapping and Medicine*, Esri Press: Redlands.
- Meade, S. Melinda and Earickson, J. Robert. 2000. *Medical Geography*, The Guilford Press: New York.
- Naish, Michael and Warn, Sue. 1993. *The Geography of Health*, Longman: England.
- Akhtar, Rais. 1991. *Environment and Health: Themes in Medical Geography*, Ashish Publication House: New Delhi.
- Cliff, D. Andrew and Haggett, Peter. 1988. *Atlas of Disease Distribution*, Blackwell Publisher: UK
- Learmonth, Andrew. 1988. *Disease Ecology*, Blackwell Publication: UK.
- Dubos, Rene. 1968. *Man, Medicine, and Environment*, Frederick A. Praeger publisher: New York.

Geography of Health Care

Geog: 675

Credit Hours (2+1)

Objective:

To understand students with the understanding of Geography of health care, its importance and scope.

Learning Outcomes:

At the end of the course, students will be able to:

1. Comprehend the Scope of Geography of health care.
2. Distinguish various terms and associated theories.
3. Understand job of health Geographer.
4. Aware about the environmental issues and their impact on health care.
5. Understand the responsibilities of mankind for health and health care.
6. Familiar with SDGS, conservation, sustainability and Aging and Pandemic.

Course Content:

Defining health and health care services, historical overview about development of health care services, concept of health and diseases and illness from geographical view point, ecology and health, spatial analysis, geographic pattern of diseases, geographic approach to analyze problems of health care in developed and developing countries, Impact of environment demography and social change on health care services, Spatial pattern of utilization of health care services and accessibility.

Lab

Quantitative analysis and preparing maps collecting data and report writing.

Suggested Readings

- Lu, Y., & Delmelle, E. (Eds.). 2019. Geospatial Technologies for Urban Health. Springer Nature.
- Crooks, V. A., Andrews, G. J., Pearce, J., & Snyder, M. 2018. Introducing the Routledge handbook of health geography (pp. 1-8). Routledge.
- Emch, M., Root, E. D., & Carrel, M. 2017. Health and medical geography. Guilford Publications.
- Maheswaran, R. 2016. GIS in public health practice. CRC Press.
- Cromley, E. K., & McLafferty, S. L. 2011. GIS and public health. Guilford Press.
- Meade, M. S., & Emch, M. 2010. Medical geography. Guilford Press.
- Brown, T., McLafferty, S., & Moon, G. 2009. A companion to health and medical geography. John Wiley & Sons.
- Gurtis, Sarah. 2004. Health and Inequality: Geographical Perspective, Sage: New York.
- Rao, Mohan. 1999. Disinvesting in Health. The World Bank's perception on Health, Sage Publications: New York.
- Gattrell, A., & Loytonen, M. (Eds.). 1998. GIS and Health (Vol. 6). Houghton Mifflin Harcourt.
- Jles, Valerie. 1997. Really Managing Health Care, University Press: Buckingham.
- Weiss. L.G, Lonquist, E. Lynne. 1994. The Sociology of Health, Healing and Illness, Prentice Hall: New Jersey.
- Bradley, W. 1993. Disease Diagnosis and Decisions, John Wiley: New York.
- H. D. Seed. 1991. Liberating Medicine, John Wiley: New York.
- William, J. Stephen and Torrens, R. Paul. 1988. Introduction to Health Services. Delmar Publishers: New York.

Environmental Impact and Analysis

Geog: 676

Credit Hours (2+1)

Objectives:

1. to identify, predict and evaluate the economic, environmental and social impact of development activities
2. to provide information on the environmental consequences for decision making and
3. to promote environmentally sound and sustainable development through the identification of appropriate alternatives and mitigation measures.

Learning Outcomes:

1. Articulate the interconnected and interdisciplinary nature of environmental studies.
2. Demonstrate an integrative approach to environmental issues with a focus on sustainability;
3. Use critical thinking, problem-solving, and the methodological approaches of the social sciences, natural sciences, and humanities in environmental problem solving;
4. Communicate complex environmental information to both technical and non-technical audiences;
5. Understand and evaluate the global scale of environmental problems; and

6. Reflect critically on their roles, responsibilities, and identities as citizens, consumers and environmental actors in a complex, interconnected world.

Course Content:

Introduction to environmental impact assessment (EIA): EIA procedures and methods, Methods of Environment components, Public involvement in EIA, Initial Examination (IE), Environmental audit, Strategic environmental assessment, Impacts upon the physical environment: water, air and land, Assessment of ecological impacts, Socio-economic impacts, Assessment of impacts on humans: Cumulative effects assessment (CEA), and consideration of alternatives in EIA and EIS review.

Environmental impact assessment, EIA in Pakistan, EPA guidelines for various projects, EIA Tools in Geography.

Lab:

Visit of ongoing projects and recording of Environmental impacts in pre, during and post phases of the projects.

Suggested Readings:

- Wood, C. 2003. Environmental Impact Assessment: A Comparative Review, 2nd edition, Prentice Hall: New Jersey
- Lawrence P. D. 2003. Environmental Impact Assessment: Practical Solutions to Recurrent Problems, John Wiley: New York.
- Schwartz, Robert. 2003. Perception, Blackwell Publication: Oxford.
- Morris, Peter and Therival, Riki. 2001. Methods of Environmental Impact Assessment, Spon Press: London.
- Marriott, B. B. 1997. Environmental Impact Assessment: A Practical Guide, 1st Edition, McGraw-Hill: New York.
- Bennett, Robert and Estall, Robert. 1991. Global Change and Challenge: Geography for the 1990, Routledge: London.
- Ervin, H. Zube. 1984. Environment Evaluation: Perception and public policy, Cambridge University Press: Cambridge.
- Saarinen, F.Thomas. 1969. Environmental Planning: Perception and Behavior. Houghton Mifflin Company: Boston.

Geography of Administration

Geog: 683

Credit Hours (2+1)

Objectives:

To deliver a knowledge of local authorities and government bodies. States, nation-states, administrative boundaries etc.

Learning Outcomes:

By the end of the semester student will be able to explain

1. Logic of administrative areas

2. Concept of territory
3. Public administration
4. States, nation states etc.
5. Territory

Course Content:

Introduction to geography of administration, the logic of administrative areas, the concept of territoriality, administration and development images of public administration a structural functional approach, the hierarchy of administrative system, the spatial structure of administrative areas, analysis of their shape, size and functional effectiveness, administrative systems of unitary and federal states, measures of functional effectiveness of an administrative area, administrative area reform, the effect of administrative area on economic and political life of a nation, a case study of Pakistan: evolution of administrative units in Pakistan, the hierarchy of administrative units in Pakistan, shifting of federal capital from Karachi to Islamabad, provincial capitals.

Lab:

Preparation of assignment on a selected political area administrative unit of Pakistan or any part of the world.

Suggested Readings:

- Herod, A.O. Tuathail, G. and Reberts, S.M. 1998. An Unruly World? Globalization, Governance and Geography, Routledge: New York.
- Woodhouse, D. 1997. In Pursuit of Good Administration, Clarendon Press. Oxford.
- Bryan, H. Massam. 1972. Spatial Structure of Administrative Systems, Resource Paper No. 12, Association of American Geographers: Washington D.C.
- Edward W. Saja. 1971. The Political Organization of Space Resource Paper No. 8, Association of American Geographers: Washington D.C.
- Zaidi, I.H. 1961. Administrative Areas of West Pakistan: A Geographical Evaluation, Ph.D. Dissertation, Department of Geography, University of Syracuse: New York.

Geography of Religion

Geog: 684

Credit Hours (2+1)

Objectives:

To identify

1. Traditional cultural geographical approaches.
2. Impact of landscape of religion
3. transforms physical spaces into sacred spaces

Learning Outcomes:

By the end of semester student will be able to understand

1. more fully understand how religious beliefs and practices affect the people of that society and region.

2. For instance, a geographer might observe how laws and social norms vary by region, and how this is connected with the religiosity of that area.

Course Content:

A definition of religion, The Universality of religion Theories of the origin of religion (The Animistic theories, The nature worship theory The theory of Original Monotheism, The magic theory, The Wish fulfillment theory, Types of religions. Intro to Geography & Intro to Geography of Religion, Geography of South Asia Hinduism, Geography of Southeast Asia, Buddhism., Geography of East Asia, Taoism; Zen Buddhism, Islam; Judaism, Geography of Europe, Geography of Latin America , Roman Catholicism.

Lab:

Analysis of the spatial distribution and pattern of world religions.

Suggested Readings:

De Blij, H. J. 2003. Human geography: Culture and Society, John Wiley: New York.
Fellmann, A. Getis. 2003. Human geography, McGraw Hills: New York.
Scott, Foreman and De Blij, H. J. 1989. World geography, Scott Foresman and Company: Illinois.
Rubenstein, M. James. 1989. The cultural landscape: An Introduction to Human Geography, Merrill Publishing Company: Columbus.
Raw and Michael. 1986. Understanding human geography: A Practical Approach, Bell and Hyman: London.

Electoral Geography**Geog: 686****Credit Hours (2+1)****Objectives:**

To study the political processes and decisions that have given rise to the political division of the world i.e. states and different political systems of the countries and maritime political limits of states.

Learning Outcomes:

The student will be able to understand:

1. Meaning and scope of the electoral geography
2. Different administrative divisions of the states
3. Resources distribution, maritime boundaries and laws of the sea.
4. Different global political conflicts and possible solutions

Course Content:

History and development of electoral geography, geography and electoral studies, electoral system and electoral data, geographical methods and approaches to electoral data analysis, elections: the plurality system preferential system, list system, mixed system, referenda & plebiscites, electoral data, voting records and ecological analysis,

survey data and opinion polls, geography of voting: political regionalism in a nation-state, political cleavage formation and political parties, mobilization of peripheries, the distribution of party voters, social bases of geographies of voting, geographical influences in voting, the constituencies and their effect on voting behavior, the neighborhood effect, empirical studies suggesting neighborhood effects rival hypothesis, candidates issues and campaigns, voting for the candidate: the friends and neighbors effect, voting on issues, the campaign, geography of representation, electoral abuses, numerical discrimination electoral reform, the problem of alternative geographies, the problem of alternative electoral system, towards a geography of power, geography, elections, representation and power, the geography of representative behavior, the value of votes, direct democracy.

Lab:

Statistical and cartographic analysis elections in various parts of the world, submission of lab. /assignment on case studies.

Suggested Readings

Held, D. 1995. Democracy and Global Order: From the Modern State to Cosmopolitan Governance, Stanford University Press: Stanford.
Guinier, L. 1994. The Tyranny of the Majority, Free Press: New York.
Gronfinan, B. Handlley, L. Niemi R. 1992. Minority Representation and the Quest for voting Equality, Cambridge University Press: New York.
Taylor, P.J. Johnston, R.J. 1979. Geography of Elections, Penguin: London.

Prehistoric Culture of Pakistan

Geog: 687

Credit Hours (2+1)

Objectives:

The main objectives of this course to provide knowledge and develop skill about the stone age cultural characteristics and understanding about pre-historic cultural landscape. The course is designed that students explore stone age culture are artifacts.

Learning Outcomes:

The outcome of the course is that students would be capable to identify various culture and techniques of classifying stone implements and artifacts of various regions.

Course Content:

Prehistoric environments, the earliest human groups and tools makers, the Paleolithic cultural phase, the Mesolithic cultural phase, the Neolithic cultural phase, Chalcolithic and age of civilization, the Indus Civilization: The Pre-Harapan cultural phase: Amri, Kulli, KotDeji etc. Harapan cultural phases: Origin of urban societies, Discoveries of Paleolithic, Neolithic, Pre Harappan and Harappan sites in Pakistan.

Lab:

Techniques of stone tool making, study of prehistoric implements and artifacts sketching of stone tools and ceramics, visit of prehistoric sites in Sindh and Baluchistan.

Suggested Readings:

Kenoyer, J. 2014. Indus Valley Civilization Publisher, Oxford University Press: Oxford
Allchin, F.R. 1995. The Archaeology of Early Historic South Asia: Cambridge University Press: Cambridge.
Cremo, Michael, A. 2018. Forbidden Archeology, Torchlight Publishers: San Jose.
Bridget and Allchin. 1988. The Rise of Civilization in India and Pakistan, Cambridge University Press: London.

Master's Thesis Geog: 689 Credit Hours (6)

A master's thesis is an extensive scholarly work on applied fields of Geography; that allows you to quarry into a topic, expand on it and demonstrate how you've intellectually grown.

Special Problem Geog: 690 Credit Hours (2+1)

Geographical phenomena, Geographical problem, Geo-spatial Problem, Case studies etc. Investigations to be decided with students according to their special interest in particular field. It will also include lessons, seminars and literature review of particular research subjects.

Agro Climatology Geog: 691 Credit Hours (2+1)

Objectives:

1. Strategic decisions in long-range planning
2. Tactical decisions in short-term planning
3. Agrometeorological forecasts Other
4. To study climatic resources of a given area for effective crop planning.
5. To evolve climate based effective farm operations.

Learning Outcomes:

1. To enable Students long range planning
2. To take decisions in short term planning
3. Student will be able to forecasts
4. To able to analyze geo spatially.

Course Content:

Introduction to agro-meteorology (major environmental factors). Acquisition and management of information sources. Climatic, hydrological and biological data. Data quality, main methodologies. Mathematical-statistical analysis of meteorological and climatic data (percentiles, heat waves, mann kendall test, etc.). Energy and Radiation Balance Applied to Different Ecosystems, Estimation and Measurement of Budget Components. Processing of radiation and budget data. From the energy balance to the Penman-Monteith equation. Evaporation and evapotranspiration, direct measurement methods, estimation equations from environmental variables. Crop coefficients and stress coefficients applied to the calculation of the actual evapotranspiration. Evapotranspiration evolution and climatic coefficients. The energy balance in connection with the water balance, also at the territorial level. Climatology and agro-climatology, climate change, impact of climate change in agriculture, adaptation and mitigation. climatic modeling for the study of climate change. Introduction to agricultural modeling. Sensitivity analysis of models. Statistical analysis of GIS methodologies. Physical principles of climate within the greenhouse: energy balance, vapor carbon balance. Control of climate in the greenhouse. Artificial light. urban microclimate: the urban heat island, parks, gardens, parking areas, crop coefficients for irrigation of urban green spaces, the case of urban gardens. urban microclimate, case of green roofs. climatological modeling for urban micro-climate. agro climatic regions of Pakistan.

Lab:

Field exercise during which an agro-meteorological station is mounted, some sensors are connected to a data logger, and put into operation. case studies. Agro climatic regions map of Pakistan, analysis of agro climatic regions.

Suggested Readings:

Jerry L. Hatfield, Mannava V.K. Sivakumar, John H. Prueger. 2019. Agroclimatology: Linking Agriculture to Climate, Volume 60. American Society of Agronomy Crop Science Society of America Soil Science Society of America. DOI:10.2134/agronmonogr60.

Stigter, Kees (Ed.). 2010. Applied Agrometeorology, Springer.

Sara E. Vero. 2021. Fieldwork Ready: An Introductory Guide to Field Research for Agriculture, Environment, and Soil Scientists. American Society of Agronomy, Inc., Crop Science Society of America, Inc., and Soil Science Society of America, Inc. DOI:10.1002/9780891183761

Thompson, D. R. and Perry, A. 2005. Applied Climatology. 1st Edition. Taylor and Francis: London.

Mavis, S. H. and Tupper, J. G. 2004. Agro Meteorology Principles and Applications of Climate Studies in Agriculture, International Book Distributing Co: Charbagh. Lucknow.

Singh, J. and Dhillon, S. S. 2004. Agricultural Geography, 3rd edition, Tata McGraw Hill Publishing Company Limited: New Dehli.

Barry, G. R. 2001. Synoptic and Dynamic Climatology, 1st Edition, Routledge: New York.

Gliessman, R. Stephen, Krieger, R. and Engles E. 1998. Agro ecology: Ecological Processes in Sustainable Agriculture, CRC: London.

Khan, A. Jamil. 1993. The Climate of Pakistan, Rehbar Publishers: Karachi.

Geography of Settlement
Geog: 692
Credit Hours (2+1)

Objectives:

The main objectives of this course to provide knowledge of settlements, patterns characteristics and understanding about settlements. The course is designed that students explore different patterns of settlements.

Learning Outcomes:

The outcome of the course is that students would be capable to identify various settlement and able to of classify their patterns of in all over the world.

Course Content:

Scope of settlement Geography, hierarchy of settlements and central place theory, urban settlements: origin and spread of cities, western and non-western urbanization, urban structure, western and non-western urban land use models, classification of urban settlements, urban fringe, suburbs satellites and urban sprawl, Rural Settlements: rural settlements forms and pattern, rural settlement types: dispersed, compact, nucleated, structure and land use of rural settlements, functional characteristics of rural settlements.

Lab:

Study of structure and land use of urban and rural settlements, application of central place theory in settlement. Study, field visit of villages and cities, case studies.

Suggested Readings:

Woods, Michael. 2015. Rural Geography, Sage publication: New York.
Michael, Pacione. 20011. Urban Geography, Routledge: New York.
William, Hornby. 2010. Settlement Geography, Cambridge University Press: London
Jones, M. 1989. Geography of Settlement, Longman: UK.
Hudson. 1988. Settlement Geography, John Wiley: New York

Rural Settlements and House Types
Geog: 693
Credit Hours (2+1)

Objectives:

The main objectives of this course to provide knowledge and develop skill about the rural settlement characteristics and understanding about rural landscape. The course is designed that students explore rural culture and rural land use.

Learning Outcomes:

The outcome of the course is that students would be able to make development of rural settlement plans and rural land use.

Course Content:

Geographic approach to rural settlement, spatial pattern and classification of rural settlements: western and non-western patterns of rural settlements (Anglo America, Latin America, Europe, Africa, East Asia, South Asia), rural settlement types in Pakistan, structure and land use of rural settlements, rural house types: geographical approach of the study of rural house types: structure, construction techniques and materials, cultural characteristics, Log houses of Anglo America, Latin American rural house types, folk houses of Europe, Africa, East Asia, South Asia, rural house types in Pakistan.

Lab:

Analysis, sketches and diagrams of rural settlement types in different countries, study of rural settlements, land use of villages of different areas of Pakistan, study of settlement pattern and functions, sketches of folk houses in different areas of Pakistan, field visits of villages.

Suggested Readings:

Woods, Michael. 2018. Rural Geography, Sage publication: New York.
Clayton. 2013. Rural Planning in Developing Countries, Earthscon publishing: London.
Norton. 2010. Cultural Geography, Oxford University Press: Oxford.
Chisholm, M. 1987. Rural Settlement and Land use, John Wiley: New York.
Spencer, Thomas. 1978. Introducing Cultural Geography, John Wiley: New York
Kappapot. 1969. House form and Culture, Englewood Cliff: New York.

Rural Geography
Geog: 694
Credit Hours (2+1)

Objectives:

The main objectives of this course to provide knowledge and develop skill about rural landscape, rural problems and rural land use planning.

Learning Outcomes:

The outcome of the course is that students would be able to develop a rural development plan and explore rural resources.

Course Content:

Scope of rural geography, process of rural change: modernity and the rural world, agricultural change, changing rural economy, social and demographic change, counter urbanization, rural development and planning, rural governance, rural life style housing, health, poverty etc. rural recreation and tourism.

Lab:

Assignment and presentation on rural problems, rural life style, rural planning, visit of rural areas, case studies. A visit to rural areas of Karachi & Thatta.

Suggested Readings:

Michael, Woods. 2015. Rural Geography, Sage publication: London.
Butler, R. 1998. Rural recreation and tourism, Longman: London.
Spencer and Thomas. 1978. Introducing Cultural Geography, John Wiley: New York
Clout, H.D. 1972. Rural Geography, Oxford University press: Oxford
Kappapot. 1969. House form and Culture, Englewood Cliff: New York.

Globalization and Development**Geog: 695****Credit Hours (2+1)****Objectives:**

The main objectives of this course to provide knowledge about the globalization and economic processes. The course is designed that students explore Industrial Centers, students can identify regional impact of trade etc.

Learning Outcomes:

The outcome of the course is that students would be capable to identify globalization and economic processes can explore Industrial Centers, students can identify regional impact of trade etc.

Course Content:

The idea of globalization, globalization as an economic process, international economy and globalization, forces of globalization, technological based industrial centers, impact of globalization on sub-national, national and regional economics, regional impact of trade and changes in trade regimes political factors of trade regimes and trade flows, FDI and investment in developing countries, role of WTO.

Lab:

Literature survey of global problems, drafting of presentation maps on global issues. Case Studies.

Suggested Readings:

Shigeru Thomas Otsubo (ed.).2015. Globalization and Development: In search of a new development paradigm, Volume III. Routledge.
Ball, R. 1997. The role of the state in the globalization of labour market: the case of the Phillipines, Environment and Planning 29. 1603-28.
Angel, D. and Savage, L. 1996. Global localization Japanese Researched Development Laborites in the USA-Environment and Planning 28, 819-33
Amin, A and Thrift, N. 1984. Globalization, Institutions, and Regional Development in Europe, Oxford

University Press: Oxford.

Arid-Land: Desertification and Management

Geog: 696

Credit Hours (2+1)

Objectives:

This course reviews and discusses the problem of desertification: what it is, its causes, manifestations, effects and scope. It proceeds to provide an overview of international law that has been developed to address desertification and the attendant ecological and socioeconomic problems, primarily by examining the scope of the 1994 United Nations Convention to Combat Desertification in Countries experiencing Serious Drought and/or Desertification (UNCCD).

Learning Outcome:

Students will be able to

1. Explain what the problem of desertification
2. Describe key provisions of the UNCCD
3. Describe and explain causes and impacts of habitat loss describe and explain the need for the sustainable management of forests,

Course Content:

Definition of arid areas, world arid land, desertification problems and management, impact of climatic change, global problems of desertification, physical, anthropogenic and cultural factors, Degradation in Pakistan, Convention to Combat Desertification (CCD), Desertification in Pakistan, National Action Plan, Driving Force, Pressure, State, Impact and Response (DPSIR) Model. Incorporation of Sustainable Development Goals.

Lab:

Case study and field visits. Applications of Remote Sensing and GIS in Arid-Land Management

Suggested Readings:

Bashir, B., Cao, C., Naeem, S., ZamaniJoharestani, M., Bo, X., Afzal, H., & Mumtaz, F. 2020. Spatio-Temporal Vegetation Dynamic and Persistence under Climatic and Anthropogenic Factors. *Remote Sensing*, 12(16), 2612.

Reed, M. S., & Stringer, L. C. 2016. *Land degradation, desertification and climate change: Anticipating, assessing and adapting to future change*. Routledge.

Sajjad, A., Hussain, A., Wahab, U., Adnan, S., Ali, S., Ahmad, Z., & Ali, A. 2015. Application of remote sensing and GIS in forest cover change in Tehsil Barawal, District Dir, Pakistan. *American Journal of Plant Sciences*, 6(09), 1501.

- Heshmati, G. A., & Squires, V. R. 2013. *Combating desertification in asia, africa and the Middle East*. New York, NY: Springer.
- Imeson, A. 2012. *Desertification, land degradation and sustainability*. John Wiley & Sons.
- Maliva, R., & Missimer, T. 2012. *Arid lands water evaluation and management*. Springer Science & Business Media.
- Anjum, S. A., Wang, L. C., Xue, L., Saleem, M. F., Wang, G. X., & Zou, C. M. 2010. Desertification in Pakistan: causes, impacts and management. *J. Food Agric. Environ*, 8, 1203-1208.
- Malagnoux, M. 2007. Arid land forests of the world: global environmental perspectives. In *International Conference on Afforestation and Sustainable Forests as a Means to Combat Desertification, Jerusalem, Israel* (pp. 16-19).
- Lackey, R.T. 2005. Economic growth and salmon recovery: an irreconcilable conflict? *Fisheries* 30(3): Gleick, P. 2000. The changing water paradigm: A look at twenty-first century water resources development, *Water International* 25(1), 127 – 138
- Pasternak, D., & Schlissel, A. (Eds.). 2001. *Combating desertification with plants*. Springer Science & Business Media.
- Guha, R. 2000. *Environmentalism: A global history* New York, Longman: New York.
- Ludwig, Hilborn, R. and Walters, C. 1993. Uncertainty, resource exploitation, and conservation: *Science* 260: 36.
- Williams, M. A., & Balling Jr, R. C. 1996. *Interactions of desertification and climate*. Edward Arnold, Hodder Headline, PLC.

Urban Ecology
Geog: 697
Credit Hours (2+1)

Objectives:

The goal of this course is to understand the balance between urban and natural environment.

Learning outcomes:

After completion of this course students able to understand the concepts and process occurred in natural and urban ecosystem. Beside this student able to use personal strategies to think and suggest that how we create balance in urban and natural ecosystem.

Course Content:

Introduction to urban ecology, urban ecology ethics: Environmental Justice, Urbanization patterns, Urban environments and ecosystem functions, Dynamic segmentation of Land cover and Land use, Urban Biodiversity Patterns and drivers; Plants & Animals, Urban socio-ecological linkages, Culture and Ecological indicators, Parks, Green areas deterioration, natural areas and conservation in urban areas, Green verses Grey areas, Monitoring, management and restoration of biodiversity, Distribution of Pollutants and Civic amenities, urban pollution and management, solid waste management, air pollution and its effects on health, heat island.

Lab:

Study of selected urban areas with special reference to environmental problems. Analysis Techniques for Urban Ecology; Shannon Diversity, matrix diversity, spatial tools for measuring ecological indicator.

Suggested Readings:

- Hansen, G. & Macedo, J., 2021, Urban ecology for citizens and planners, University of Florida Press, USA
- Aronson, M.F.J. et al., 2014, A global analysis of the impacts of urbanization on bird and plant diversity reveals key anthropogenic drivers. *Proceedings of the Royal Academy B*.
- Davies, T.W., J. Bennie, and K.J. Gaston. 2012. Street lighting changes the composition of invertebrate communities. *Biology Letters* 8:764-767.
- Duncan, R.P. et al. 2011. Plant traits and extinction in urban areas: a meta-analysis of 11 cities. *Global Ecology and Biogeography* 20: 509-519.
- Goddard, M. A., A. J. Dougill, and T. G. Benton. 2010. Scaling up from gardens: biodiversity conservation in urban environments. *Trends in Ecology & Evolution* 25: 90-98.
- Herbert, T. D. and Thomas, J. C. 2005. *Cities in space: City as Place*, 3rd Edition, David Fulton Publishers: London.
- Lackey, R.T. 2005. Economic growth and salmon recovery: an irreconcilable conflict? *Fisheries* 30(3): 30-32.
- Gleick, P. 2000. The changing water paradigm: A look at twenty-first century water resources development. *Water International* 25(1), 127 – 138.
- Guha, R. 2000. *Environmentalism: A global history*, Longman: New York
- Ludwig, D. Hilborn, R. and Walters, C, 1993 Uncertainty, resource exploitation, and conservation: lessons from history *Science* 260: 36.
- Davies, K. W. and Herbert, D.T. 1993. *Communities with in Cities: An Urban Social Geography*, Bellhaven Press: New York.
- Herbert, D. and Thomas, J. C. 1982. *Urban Geography*, John Wiley: New York.
- Herbert, T. D and Thomas, J. C. 1982. *Urban Geography*, John Wiley: New York.
- Freedman, B. 1998. *Environmental Science: A Canadian perspective*, Scarborough, Prentice Hall: Canada.

Geographies of Gender and Identities**Geog: 698****Credit Hours (2+1)****Objectives:**

The main objective of the subject is to identify the gender gaps; when it comes to health and economic progress, it is projected that the gender gap will take 217 years of progress before it is closed. Political progress is even wider; it is projected to have closed within 99 years. In short, governance and action is needed that supports women and girl's access to public and private spheres in society.

Learning outcomes:

By the end of the semester the learning outcomes of Geographies of Gender and Identities raise some critical questions

1. How does gender inequality appear around the world?
2. What is feminist geography?
3. Why is gender important to understanding space and place?
4. What is the history of women at the Royal Geographical Society?

Course Content:

Defining and conceptualizing feminist and gender geography, feminist theories, difference and politics of knowledge, emergence of feminist geography, space, place and gender: a theoretical perception, gendering spaces of work, public and private, gender, globalization and development, gender and environment, gender, national and the politics.

Lab:

Preparing maps, field work and report writing.

Suggested Readings:

- Ronnie, Vernooy. 2006. Social and Gender Analysis in Natural Resource Development. Learning Studies and Lessons from Asia, Sage: New York.
- Jon, Murdoch. 2005. Part-structuralize Geography. A Guide to Relational Space, Sage: New York.
- Phil, Hubbard. 2005. Key Thinkers on Space and Place, Sage: New York.
- Sumi, Krishna. 2005. Lively hood and Gender, Sage: New York
- Kofman, E, Ragheeram, P. 2005. Gender and Skilled Migrants: Into and Beyond the Workplace, Special Issue of Geoforum. Vol. 36, No.2 pp. 149-154.
- Lunn, Stacheh, M. Kopman and Linda, Peake. 2005. Mapping Gender, Making Policies: Ferminist Perspectives on Political Geography, Routledge: New York.
- Neel, Castree. 2004. Spaces of Work. Global Capitalism and Geographic of Labours, Sage: New York.

Advanced Cartography

Geog: 699

Credit Hours (2+1)

Objectives:

To develop all GIS based skills to working with geometries. Compute Feature data analysis

Learning outcomes:

1. Understand and implement complex color map design techniques.
2. Planning time estimates, a production schedule, compilation, production, duplication methods.
3. Explore design strategies to achieve good contrast, figure/ ground relationships, and color harmony.
4. Gain a better understanding of how people perceive color symbolization on maps.

Course Content:

Introduction and scope of advance cartography, Introduction to Map and mapping, Essential of Maps, Need of maps, Types of maps, Basic Geodesy, Map Projections, coordinate system, Advance Cartographic Systems (Hardware and software), Geographic data collection, Data models for digital cartographic information, , Spatial data, Attribute data, data transformation, Map production and reproduction, Cartographic design, Map Compilation, cartographic abstraction/generalization, typography and lettering the map, color use guidelines, symbolization, visualization and its historical context, under represented populations in cartography, Classic Cartography Techniques, distributed GIS, internet mapping for education, commercial web mapping programs, internet mapping, Digital Cartography and Satellite Data ,Terrain data (Digital Elevation Model/ Digital Terrain Model), Proximity Analysis, Tracking Analyst: Analyzing hurricanes using Tracking Analyst, Mapping Flow Data Cartographic Design: Special Topics, advance cartography and GIS, Future trends of advance cartography.

Lab:

Detail exercises on ARCMAP to enable the students for making digital maps, diagrams and cartograms. Maplex Label Engine, Arcscan and 3D Analyst: Viewing DEM (SRTM) Data in 3D, Classic Cartography Techniques, Proximity Analysis , Tracking Analyst: Analyzing hurricanes using Tracking Analyst Basics of Thematic Mapping: .Choropleth Mapping, Proportional Symbol Mapping, Dot Density Map, Isarithmic Maps (Spatial Analyst), Pie Diagram, Landuse and land cover mapping, Mapping Flow Data,

Suggested Readings:

Baker, Thomas. 2005. Internet-Based GIS Mapping in Support of K-12 Education: The Professional Geographer 57 (1): 44-50.

Tang, Winnie, Jan and Selwood. 2003. Connecting Our World. Redlands, CA: ESRI Press: Redlands.

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.

Nelson, S, Elisabeth. 2000. The Impact of Bivariate Symbol Design on Task Performance in a Map Setting, Cartographica. 37(4): 61-77.

Van, Den, Hoonard, Will. 2000. Getting There without Aiming at It: Women’s Experiences in Becoming Cartographers, Cartographica. 37(3): 47-60.

H. Wood, C. Peter and Keller, Cartographic Design: Theoretical and Practical Perspectives, John Wiley & Sons: New York.

Robinson, A. H. 1995. Elements of Cartography, 6th edition, John Wiley: New York

Abrams, J. and Hall, P. 2006 “Else/Where: Mapping — New Cartographies of Networks and Territories”. University of Minnesota Design Institute, Minnesota.

Brewe, A. C. 2005 “Designing Better Maps: A Guide for GIS Users”. ESRI Press. P. 220.

Carey, H. H. 1983 “How to use maps and globe”. Franklin Watts, London.

Dink, P. (latest edition): “Map Work”. Atma Ram and sons, New Delhi.

Ehrenberg, R. E. 2005 “Mapping the world: An illustrated history of cartography”. National Geographic.

Maginr, D. J. 1991 “Geographic Information System”. Longman, London.

- Shaheen, F. 1998: “A New Geography Book on Map Work and Field Work”. A.H. Publishers, Lahore.
- MONKHOUSE, F.J. & H.R. WILKISON 1963: Maps and Diagrams, Their Compilation and Construction. London (Latest Edition)
- RAISZ, E. (1948): General Cartography. McGraw-Hill London. (Latest Edition)
- RAISZ, E. 1962: Principles of Cartography. McGraw-Hill London. (Latest Edition)
- ROBINSON, A.H., MORRISON, J.L, MUHRCKE P.C., KIMERLING A.J. & S.C. GUPTILL 1995: Elements of Cartography. John Wiley and Sons New York. (6th Edition)
- ROBINSON, A. 1963: Elements of Cartography. John Wiley and Sons New York. (3rd Edition)
- SINGH, R.L. 1960: Elements of Practical Geography. Allahabad. (Latest Edition).

New Proposed Course outlines

Road Safety in Geography

Geog: 641

Credit Hours (2+1)

Objectives:

1. To understand the concept and need of Road safety.
2. To understand the different types of road crashes and their causes.
3. To understand the consequences of road crashes in urban areas and on highways.
4. To estimate the damage cause due to road crashes.
5. To understand the traffic management system in different regions of the world.

Learning Outcome:

1. Concept and importance of Road safety.
2. Different approaches will help to learn about how to measure road safety parameters?
3. Different types and causes of road crashes and road injuries
4. Consequences of different types of road crashes and road injuries.
5. Recovery and rehabilitation phase from Road Traffic Injuries
6. Measures to adopt in road safety.
7. Vulnerable road users and their precautionary measures to avoid road crashes.
8. Road safety design and road accessories
9. Economic and financial burden due to road crashes on societies and on countries.
10. Concept of Road Safety audits and their application.
11. Implementation of road safety in different sectors of traffic in cities and on highways.

Course Content:

Basic Concept of Road Safety, Need of Road safety, Approaches in Road Safety: Human capital approach, willingness to pay approach, Road Safety issues in Urban areas, Human behavior and Road Safety, Road Safety in regional context, Components of Road Safety: (Environmental, Human and vehicular consideration in Road safety),

challenges of road safety on high ways challenges of road safety in urban areas, Traffic management system, Accessibility and safety measures, land-use and road safety approach, consequences of poor road safety at global level, impact of good road safety at different societies at global level, global scenario of road safety, different modes of urban transport and safety requirements, high and low road safety/risk areas, O-D cost matrix and safety measures.

Lab:

Calculation of losses due to poor road safety, identification of high risk and low risk areas in term of road safety, development of hazard matrix, use of network analysis with different impedance considering safety measures, hotspot analysis, buffer analysis.

Suggested readings:

El-Said Mamdouh Mahmoud Zahran, Soon Jiann Tan, EngHie Angel Tan, Nurul Amirah 'AtiqahBintiMohamad 'Asri Putra, Yok Hoe Yap &EnaKartina Abdul Rahman Spatial analysis of road traffic accident hotspots: evaluation and validation of recent approaches using road safety audit, *Journal of Transportation Safety & Security*

Peng H, Tim H, Keong C. Proc. Road Saf. Four Continents Conf. Using GIS technology to enhance road safety in Singapore 2007; 14: 10p

Salman Zubair, S. ShahidShaukat, Lubna Ghazal and Jamil HasanKazmi Assessment of Human Exposure to Traffic Borne Problems in Karachi *Int. J. Biol. Biotech.*, 13 (1): 153-162, 2016.

Amir MohammadianAmiri, NavidNadimi, VahidKhalifeh& Moe Shams (2021) GIS-based crash hotspot identification: a comparison among mapping clusters and spatial analysis techniques, *International Journal of Injury Control and Safety Promotion*

El-Said Mamdouh Mahmoud Zahran, Soon Jiann Tan, EngHie Angel Tan, Nurul Amirah 'AtiqahBintiMohamad 'Asri Putra, Yok Hoe Yap &EnaKartina. Abdul Rahman (2021) Spatial analysis of road traffic accident hotspots: evaluation and validation of recent approaches using road safety audit, Taylor and Francis.

Road Transport (Safety and Traffic Management) (Road Rules) Regulation 1999, Road Transport (Safety and Traffic Management) Act 1999.

Hans-Leo Ross (2018) Functional Safety for Road Vehicles New Challenges and Solutions for E-mobility and Automated Driving Safe Streets for London. The Road Safety Action Plan for London 2020 Working together, towards roads free from death and serious injury (WHO Report).

Climate Change Studies

Geog: 654

Credit Hours (2+1)

Objectives:

To study the major factors contributing towards climate change and impact of climate change on human and their activities as well as plants and animals.

Learning Objectives:

The student will be able to comprehend:

1. The meaning and scope of the subject.

2. Global Warming and Global Ocean Warming: El Nino-La Nina.
3. Its impact on Cropping patterns, Disease patterns, animal and plants behavior and adaptations.
4. Alteration of various climatic processes, incident of droughts, flooding, forest fires, glaciers melting and sea level rise and vice versa.

Course Content:

Climatic change throughout geologic time, especially the last 10 millennia; mechanics of change, evidence, and criteria, paleography and paleo climatology, Impact of climate in shaping human societies; focus on how climate and climate variability affects food production, water use, energy use, and human disease systems (e.g., influenza, malaria, air pollution, diarrheal disease); climate change impacts (e.g., sea level rise, droughts, wildfires, famine); societal impact, adaptation and vulnerability, mitigation strategies; policy.

Labs:

Case studies and field work relevant to the climate changes and their impact.

Suggested Readings:

- Cracknell, P. & Varotsos, A.C. 2021. Understanding Global Climate Change: Modelling the Climatic System and Human Impacts. 2nd edition. CRC Press.
- Hulme, M. 2021. Climate Change. 1st Edition. Routledge.
- Curley, M. 2021. The Price of Climate Change: Sustainable Financial Mechanisms. 1st Edition. CRC Press.
- Fahad, S., Sonmez, O., Saud, S. Wang, D., Wu, C., Adnan, M. & Turan, V. (Eds.). 2021. Developing Climate-Resilient Crops: Improving Global Food Security and Safety. 1st Edition. CRC Press.
- Wells, W. D. 2020. The Uninhabitable Earth: Life After Warming. Tim Duggan Books.
- Lovejoy, E. T., Hannah, L. & Wilson, O. E., 2019. Biodiversity and Climate Change: Transforming the Biosphere. Yale University Press.

Urban Agriculture and Regional Food Systems

Geog: 669

Credit Hours (2+1)

Objectives:

This multi-disciplinary course introduces students to the

- concept of producing food in an urban setting
- explains the evolving food system
- Examine the spatial assessment of agricultural land use in and around cities
- To ascertain the spatial concentration of agricultural phenomena.
- Experiment different remote sensing tools in the field of agricultural geography.
- Assess urban and peri-urban regions of cities.

Learning Outcomes:

students will learn about the

- nutritional aspects, storage requirements and utilization of crops
 - Topics including urban livestock, aquaculture, apiculture, rooftop gardening, hobby greenhouse production, and environment modification will be briefly discussed.
 - Students will learn how the urban food production movement has influenced urban design and utilization of land within urban settings. Environmentally friendly practices including water harvesting, composting, organic production, and integrated pest management will be discussed.
4. To assess all remote sensing and GIS based analysis of agricultural land-use.
 5. To prepare the student to be able to interpret and judge the value of data, procedures, methods, and results.

Course Content:

Smart cities and eco innovations: concepts, principals and applications. Urban agriculture: Urban, peri-urban farming and local food system – techniques, farming practices, work organization, resources management, agricultural rotation and association, Urban gardening practices (principles and techniques), Municipal urban farming policy: comparative studies in various cities of municipal programs to encourage urban gardening (Paris, Montreal, New York, Lisbon, Seville, Karachi, Lahore etc.), Diversity of the functions and types of community gardens in industrialized countries, Diversity of amateur farming practices, Green roof and tops (advantages and disadvantages, typology of roofs, technical key points: Waterproofing, Drainage, Substrate, Watering, Safety, Vegetable Palette; Cultural monitoring). planning & Urban design: the sustainable city: adaptation and mitigation strategies to climate change, Landscape Character Assessment and Visual Impact Assessment as a design, Green Infrastructure and Strategic Master planning. Urban food System: Debate on urban food governance and urban food security: the urban food policies The contribution of peri-urban farming system to local food system: taking into account the different perspectives of farmers and food system’s actors in a case study analysis.

Lab:

Utilize modern industry-standard GIS software for conducting basic GIS analyses and producing cartographic output for urban agriculture. Conduct studies typically carried out in GIS including site selection, analysis of spatial/temporal processes, geocoding and point pattern analysis, and corridor studies. Field Experiments.

Suggested Readings:

Sara E. Vero. 2021. *Fieldwork Ready: An Introductory Guide to Field Research for Agriculture, Environment, and Soil Scientists*. American Society of Agronomy, Inc., Crop Science Society of America, Inc., and Soil Science Society of America, Inc. DOI:10.1002/9780891183761

Jennifer Cockrall-King. 2012. *Food and the City: Urban Agriculture and the New Food Revolution* Paperback. Prometheus.

Luc J. A. Mougeot. 1999. *Urban Agriculture: Definition, Presence, Potentials and Risks, and Policy Challenges*. IDRC.

Luc J.A. Mougeot. 2006. Growing better cities: Urban agriculture for sustainable development. IDRC. e-ISBN 1552502422.

Foundations of Drone Mapping

Geog: 655

Credit Hours (2+1)

Objectives:

Provide Drone surveying and mapping which give the ability to “see the broad and immediate view of landscape”

Learning Outcomes:

1. Can done surveying through drone
2. Can maintain highly accurate measurements
3. Can use techniques of fast surveying.

Introduction to UAV Technology, Historical Evolution of Drones, Types of Drones, UAV Legislations and safety measures, Basic GIS Skills for Drone Mapping, Drone Configuration and Flight Planning, GCPs logging and Geo-referencing, Data Collection and Management, Pre and Post flight Checklist, Introduction to Drone data processing, Types of Drone Maps: Ortho photo, DEM, DTM and 3D Point Cloud Generation, Creation of 3D Mesh and Fly-through video creation, Sensor Integration, Multispectral Aerial Imagery Collection and Processing, Visualizing and Analyzing Lidar Data, Applications of Drone Imagery, Environmental Mapping through Drones, UAV for Precision Agriculture, Ortho mosaic based Precision Agriculture Analysis, Multispectral Imagery based Indices (NDRE, NDVI), UAV for Change Detection, Application of UAV in Topographical Mapping, UAV in Geography, UAV in Surveillance search and Rescue, Future of Drone Technology.

Lab:

Basic GIS Skills for Drone Mapping, GCPS logging and Geo-referencing, Introduction to Drone data processing, Multispectral Aerial imagery collection and processing, 3D, Mapping through Drone Technology in Pix4D.

Suggested Readings

Anderson, K., Griffiths, D., DeBell, L., Hancock, S., Duffy, J. P., Shutler, J. D., Griffiths, A. (2016). A grassroots remote sensing toolkit using live coding, smart phones, kites and lightweight drones. PLoS ONE, 11, e0151564.

Brooke-Holland L. (2012). Unmanned Aerial Vehicles (drones): An Introduction, House of Commons Library, UK.

Casagrande G. (2018a). Small Drones and Geographic Observation, in Casagrande, G., Sik, A., & Szabó, G. (Eds.). (2018). Small Flying Drones. Springer.

Garrett, B. and Anderson, K. (2018). Drone Methodologies: Taking flight in Human and physical Geography. Trans Inst Br Geogr. 2018; 43:341–359.

Kedia, A.C.; Kapos, B.; Liao, S.; Draper, J.; Eddinger, J.; Updike, C.; Frazier, A.E. (2021) An Integrated Spectral–Structural Workflow for Invasive Vegetation Mapping in an Arid Region Using Drones. *Drones* (MDPI), 5, 19. <https://doi.org/10.3390/drones5010019>.

Yavasli, D. D. (2020) Drone Applications in Geography: Game of Drones. In *Current Studies of Social Sciences II*. Balciogullari, A. and Sahin, M. C. (Eds.). Vadi Printing Press: Ankara.

Spatial Database Programming in Geography

Geog: 663

Credit Hours (2+1)

Objectives:

Major Objective of this course is to develop the concept of object-based programming, object oriented design and problem solving skills using object oriented techniques.

Learning Outcomes:

After completion of this course students able to comprehend, composed and developed object based programs that further used in Geographical Analysis as they specifically designed for geographical data.

Understanding Database System, Database Structure, Data Modeling, Database Design, Spatial Database, Introduction to Programming, Program Logics, Object Oriented Programming, Properties and Methods of Objects, Database connections, Introduction to current language, GUI Development, Loops and Decision Constructs, designing of a Database Application, Geographical Database management, manage your own geographical database.

Lab:

Structured Query language commands, PL/SQL Commands, Creating & populating tables, Design of simple database: Conceptual, logical and physical level, Database normalization process techniques, Query optimization (Relational Algebra), Indexing concepts, Performance of concurrency protocols, Partial & full recovery techniques, Concepts of database securities, Development of a GUI interface.

Suggested Readings:

Macleod, C. D. 2019. An introduction to species distribution modelling (SDM) using QGIS and R, Pictish Beast Publication, UK.

Allen, D. W., 2019. Focus on Geodatabases, ArcGIS pro, ESRI Press, USA.

Lawhead, J., 2019. Learning Geospatial Analysis with Python: Understand GIS fundamentals and perform remote sensing data analysis using Python, Packet publishing, UK.

Kerski, J. J. 2012. The GIS guide to public domain data. ESRI Press, USA.

Gillenson, M. 2005. Fundamentals of Database Management Systems, John Wiley & Sons: New York.

Kroppla, B. 2005. “MapServer: Open Source GIS Development” Apress, Co. ISBN: 1590594908

Worboys, M. and Matt Duckham 2004 GIS: A Computing Perspective, 2nd Edition CRC Press; 2nd edition ISBN: 0415283752

Date, C. D. 2004. Database Systems, Addison Wesley Pub. Co.: New York, ISBN – 0201385902.

Connolly, R. and P.Begg (003. *Database Systems: A Practical Approach to Design, Implementation and Management*, Wesley Pub. Co, New York, ISBN – 0321210255.

Elmasri, R. and Navathe, S.B 2004. “Fundamentals of Database Systems” Addison-Wesley Pub. Co ISBN – 0-201760355.

Geodesy
Geog: 664
Credit Hours (2+1)

Objective:

Its main aim is not to determine the exact earth's shape but to establish an accurate and rigid control for all other surveys' coordination.

Learning Outcomes:

Student will able to

1. Understand projection systems and datum.
2. Student will able to survey through GPS.
3. Student will able to explain geodetic control.

Course Content:

An Introduction to Geospatial Science and Technology Coordinates and Coordinates System Datum and Geodetic Systems Projections and Types of Projection Shape of the Earth Coordinate Transformation Global Positioning System (GPS) Fundamentals of GPS Signals and Data GPS Surveying and Mapping Processing Spatial Data Practical Geodesy Using Computers Applications of Satellites to Geodesy.

Lab:

GPS surveys, DGPS surveys, Land based surveys

Suggested Readings:

Bossler, J. D., John R. Jensen, McMaster, R. B., and Rizos, C. Manual of Geospatial Science and Technology 2001. 1st edition; CRC Press: New York. ISBN: 0748409246

Kaula, W. Theory of Satellite Geodesy : Applications of Satellites to Geodesy 2000. Dover Publications ISBN: 0486414655 ST

Hooijberg, M. Practical Geodesy Using Computers (October 29, 1997) 1 edition Publisher: Springer; ISBN: 3540618260 Bugayevskiy :

M., and John Snyder, 1995, Map Projections: A Reference Manual, CRC Press, ISBN-10: 0748403043.

Introduction to Global Positioning System (GPS)

Geog: 645

Credit Hours (2+1)

Objectives:

The Global Positioning System GPS is one of the most powerful modern technologies. Civilian applications of GPS are rapidly growing and these applications will revolutionize our society in the near future. Many opportunities exist in industry and government agencies for engineers with background and formal training in GPS theory and design. This course will provide students with a firm background in the fundamentals of GPS theory and design. The course has a required weekly laboratory component which will provide students with hands on experience through laboratory experience and a design project.

Learning Outcomes:

After completion of this course students able to handle GPS, well versed with coordinate systems, will able to done GPS survey planning.

Course Content:

Introduction to Global Positioning System. Components / Segments of Global Positioning, System. Some Basic Terminologies used in GPS Survey. Various Types of GPS Receivers. GPS Survey Techniques. GPS Survey Planning. Main Steps involved in GPS Project. Sources of Error. PDOP (Position Dilution of Precision). Improving Accuracy through Advanced forms of GPS. GPS Network Design. Coordinate systems. GPS Applications/Uses. GPS Survey Vs Conventional Survey and. Scope of GPS

Lab:

a) Introduction to GPS Software b) GPS-Mission Planning c) Reconnaissance of Area and Establishment of GPS Stations d) Introduction to GPS Instrument e) Components of the Instrument f) Reference Receiver g) Rover Receiver h) Setting up the instrument properly i) Proper operation of the instrument j) Dealing Jobs k) Configuring the GPS instrument l) Selecting various options and Input data m) GPS-Observation n) GPS-Baselines Processing o) GPS-Data Adjustment p) Adjustment of Data with reference to 'A' or 'AB' order Network q) Detection of Blunders and Improvement of Accuracy Standards r) Comparison of GPS Coordinates with Local Everest coordinates s) Transformation Parameters t) Conversion of Coordinates from WGS-84 to Everest and Vice Versa u) Submission of Final Results and Reports

Suggested Readings:

Aronoff, S. 2006, "Geographic Information Systems: A Management Perspective", Black Well Publications, Ottawa, Canada, Forth edition Getting started with GPS Surveying .GPSCO Land Information centre, NSW, Australia.

Erle, S., Gibson, R., Walsh, J. 2005, "Mapping Hacks: Tips & Tools for Electronic Cartography", O'Reilly Media, China. Letham, L. 1995. "GPS", Rocky Mountain Books, Calgary.

Global Positioning System: Theory and Applications. Vol. 2. American Institute of Aeronautics & Ast, 1996. ISBN: 9781563471070.

GPSCO 1992. Getting started with GPS Surveying. GPSCO Land Information Centre, NSW, Australia. Geographic Information Systems: A Management Perspective. WDL

Heywood, I., Cornelius, S. and Carver, S. 1999. An introduction to Geographic Information System. Addison Wesley Longman, New York, second edition. ISBN: 0 – 81-7808 – 982 -3

Hofmann-Wellenhof, B., H. Lichtenegger, and J. Collins. *GPS Theory and Practice*. Springer, 1994. ISBN: 9780387824772.

Kennedy, M. 2002, "The Global Positioning System and GIS: An Introduction" 2nd Edition, Taylor & Francis, New York.

Michael Kennedy 2002. The Global Positioning System and GIS: An Introduction. 2nd Edition, Taylor & Francis, New York.

Monmonier, M. 2002, "Spying with Maps", The University of Chicago Press, Chicago.

Parkinson, B. W., J. Spilker, et al. *Global Positioning System: Theory and Applications*. Vol. 1. American Institute of Aeronautics & Ast, 1996. ISBN: 9781563471063.

Paul Zarchan 1996. Global Positioning System: Theory and Application. Volume I, American Institute of Aeronautics and Astronautics, Inc., Washington DC.

Teunissen, P and Montenbruck, O, 2017, Springer Handbook of Global Navigation Satellite Systems ,Springer International Publishing, 16-Jun-2017 - Science - 1327 pages

Zarchan, P. 1996, "Global Positioning System: Theory and Application, Volume I, American Institute of Aeronautics and Astronautics, Inc., Washington DC.

Some Websites to Explore

U.S. Coast Guard Navigation Center Website

University NAVSTAR Consortium Website

SCIGN Data Portal Website

Mobile technology for Geographic Data Collection

Geog:656

Credit Hours (2+1)

Objectives:

The subjective of the course is to make students familiar with the use of different mobile technologies for the real time data collection from field and its analysis.

Learning Outcomes:

After completion of this course students able to handle and operate all mobile technology.

Course Content:

Introduction to mobile technology History of Mobil Technology for Data Collection Scope & status of Mobil Tech in modern era Applications of GPS enabled Mobil tech

in different sectors Type of mobile phone used for data collection GPRS and GPS enabled. Questionnaire Designing for Mobile Applications ODK Tools registration & Visualization and analysis through ODK and relevant database systems and software preparation and configuration for Survey Form Uploading and Retrieving Field orientation and practice for various types of data including x-y coordinates and its retrieval.

Lab.:

Tools registration, preparation and designing of questionnaires in xml, field survey, categories, their uploading and implementation. Field Outline Field orientation and practice for various types of data including x-y-z coordinates and its retrieval, visualization and analysis through ODK (open Data toolkit).

Suggested Readings:

Fogg B.J. 2003. Persuasive Technology: Using Computers to Change What We Think and Do. (Interactive Technologies). Kaufmann Morgan Publishers San Francisco, USA

Gary, W. 2010. The Mobile Learning Edge: Tools and Technologies for Developing Your Teams. McGraw-Hill. Kevin S. and Klaas, W. 2011. Building the mobile networking technology. Cisco Systems Indianapolis, USA.

Muehlenhaus I. (2014) Web Cartography: Map Design for Interactive and Mobile Devices. CRC Publisher, London.

Quinn C N. 2011. The Mobile Academy: M-Learning for Higher Education. John Wiley and Sons. Trimble 2009: Mapping and GIS customer stories. URL source: http://www.trimble.com/mgis/customer_stories.aspx Tsou, M.-H. 2004. Integrated mobile GIS and wireless internet map servers for environmental monitoring and management. Cartography and Geographic Information Science 31(3), 153- 165.

Wankel, LA and Blessinger P. (Eds.) 2013. Increasing Student Engagement and Retention using Mobile Technologies in Higher Education). Emerald publishing services UK. URL Sources: <http://mobile phones for data collection mobile active .org> <http://www.theclearinitiative.org/mobile-based-tech.pdf> Applications: Smartphones, Skype and Texting Technologies (Cutting-Edge .

Hydro-Geography

Geog: 659

Credit Hours (2+1)

Objectives:

To acquaint the students with principles and processes governing the movement of water through the hydrologic cycle, hydrograph, hydrologic statistics, frequency and water quality analysis techniques.

Learning Outcome:

Students will be able to Describe

1. The distribution of the Earth's water, interpret the water cycle, compare the availability of safe drinking water (potable water) in different parts of the world, describe and evaluate multipurpose dam projects , Sources and explain the

- impact of pollution of fresh water on people and on the environment, explain strategies for improving water quality
2. Evaluate the need of quantitative and qualitative assessment of water resources for better Socio-economic and environmental growth at local and National scale.

Course Content:

Unique characteristics of freshwater; geographic perspective, freshwater distribution in space and time around the Earth, natural processes of aquatic ecosystems, identify the challenges in water management in varied climate types around the world; Drainage basin characteristics: size and shape, drainage density, watershed management, Impact of human's interaction with aquatic ecosystems. The transformation of landcover and landuse in basins/catchment areas (deforestation, afforestation, urbanisation), abstraction and water storage, degradation of soils and ground water, causes, effects and solution of Hydro-meteorological hazards (Floods, Drought). National and International Organizations engaged in solving the crises and conflicts over freshwater; Lab: Application of Remote sensing and GIS in water resources distribution and management.

Suggested Readings:

- Ahmed, K., Watto, M. A., Shahid, S., Nawaz, N., & Khan, N. 2021. Spatial Variability of Groundwater Storage in Pakistan. *Water Resources of Pakistan: Issues and Impacts*, 9, 209.
- Wang, Y., Liu, X., & Hu, W. 2021. The research on landscape restoration design of watercourse in mountainous city based on comprehensive management of water environment. *European Journal of Remote Sensing*, 54(sup2), 200-210.
- Muhammad ArifWatto. 2021. *Water Resources of Pakistan: Issues and Impacts* (World Water Resources, 9) 1st ed. 2021 Edition Springer; 1st ed. 2021 edition (March 26, 2021)
- Jamil, M. 2019. *Running Dry: Water Scarcity in Pakistan*. Naval Postgraduate School Monterey United States.
- Stucker, D., & López-Gunn, E. (Eds.). 2014. *Adaptation to climate change through water resources management: Capacity, equity and sustainability*. Routledge.
- Manish Dubey, 2009. *Agriculture and Water Management*. Cyber Tech Publications: India.
- Lackey, R.T. 2005. Economic growth and salmon recovery: an irreconcilable conflict? *Fisheries* 30 (3): 3032.
- Hancock, G. R., Martinez, C., Evans, K. G., & Moliere, D. R. 2006. A comparison of SRTM and high-resolution digital elevation models and their use in catchment geomorphology and hydrology: Australian examples. *Earth Surface Processes and Landforms: The Journal of the British Geomorphological Research Group*, 31(11), 1394-1412.
- Falkenmark, M., & Rockstorm, J. 2005. *Balancing Water for Humans and Nature*. Earthscan, UK.
- Jain, K. S. and Singh P. V. 2003. *Water Resources Systems Planning and Management*, 1st Edition, Elsevier Science: New York.

Mays, W. L. 2004. Water Resource Systems Management Tools, 1st Edition, McGraw-Hill: New York.

McRae, D. M. and Pearse, P. H. 2004. Treaties and transition: towards a sustainable fishery on Canada's Pacific Coast, Federal-Provincial Joint Task Group Report: 58pp.

Karamouz, M. Szidarovszky, F. and Zahraie, B. 2003. Water Resources Systems Analysis, CRC: London.

Lyon, G. J. 2002. GIS for Watershed and Water Resource Management, CRC: London.

Pauly, D, V. Christensen, S. Gu nette, T. Pritcher, U. Sumaila, C. Walters, R. Watson, and D. Zeller. 2002. Towards Sustainability in World Fisheries, Nature 418, 8 August, pages 689 – 695.

Urban Landscape Ecology

Geog: 661

Credit Hours (2+1)

Objectives:

The goal of this course is to understand the balance between urban and natural environment.

Learning outcomes:

After completion of this course students able to understand the concepts and process occurred in natural and urban ecosystem. Beside this student able to use personal strategies to think and suggest that how we create balance in urban and natural ecosystem.

Course Content:

Scope of landscape ecology; conceptual issues and foundations; Landscape ecology and its principals Causes of landscape pattern; Quantifying pattern: Landscape metrics and interpretation; multiple metrics; Understanding landscape metrics; Landscape models –neutral landscape models, spatial models; Disturbance and landscapes– Reciprocal pattern-process, thresholds, interactions; Spatial heterogeneity and Urban ecosystem. Modeling ecosystem processes; Applied landscape ecology—Land use change, invasive species; Emerging directions – Landscape ecology and ecosystem services; Future directions—where does landscape ecology go from here. Landscape ecology and its principals Hierarchy Theory of Landscapes, Pattern-Process Principle, Landscape Connectivity, Metapopulation Theory, Urban Sustainability resilience, Role of Urban Forestry in landscape design of Eco-Cities, Sustainable Development goals.

Lab: Field work and Case study. Application of Remote sensing and GIS in Urban Landscape Studies.

Suggested Readings:

Wang, Y., Liu, X., & Hu, W. 2021. The research on landscape restoration design of watercourse in mountainous city based on comprehensive management of water environment. *European Journal of Remote Sensing*, 54(sup2), 200-210.

- Gilani, H., Ahmad, S., Qazi, W. A., Abubakar, S. M., & Khalid, M. 2020. Monitoring of Urban Landscape Ecology Dynamics of Islamabad Capital Territory (ICT), Pakistan, Over Four Decades (1976–2016). *Land*, 9(4), 123.
- Murgui, E., & Hedblom, M. (Eds.). 2017. *Ecology and conservation of birds in urban environments*. Cham: Springer.
- Francis, R. A., Millington, J. D., & Chadwick, M. A. (Eds.). 2016. *Urban landscape ecology: science, policy and practice*. Routledge.
- Relph, E. (2016). *The modern urban landscape*. Routledge.
- Forman, R. T. 2014. *Urban ecology: science of cities*. Cambridge University Press.
- Ahern, J. 2013. Urban landscape sustainability and resilience: the promise and challenges of integrating ecology with urban planning and design. *Landscape ecology*, 28(6), 1203-1212.
- Wu, J., He, C., Huang, G., & Yu, D. 2013. Urban landscape ecology: Past, present, and future. In *Landscape ecology for sustainable environment and culture* (pp. 37-53). Springer, Dordrecht.
- Cook, E. A., Cook, E., & Lara, J. J. (Eds.). 2013. *Remaking metropolis: global challenges of the urban landscape*. Routledge.
- Maginnis, S., Rietbergen-McCracken, J., & Sarre, A. (Eds.). 2012. *The forest landscape restoration handbook*. Routledge.
- Stanturf, J., Lamb, D., & Madsen, P. (Eds.). 2012. *Forest Landscape Restoration: integrating natural and social sciences* (Vol. 15). Springer Science & Business Media.
- Farina, A. 2012. *Landscape ecology in action*. Springer Science & Business Media.
- Gaston, K. J. (Ed.). 2010. *Urban ecology*. Oxford University Press.
- Kaplan, D. M., & White, C. G. 2002. *Integrating landscape ecology into natural resource management* (No. 1). Cambridge University Press.
- Harker, D. 1999. *Landscape restoration handbook*. CRC Press.