

Learning Outcomes Based Curriculum Framework (LOCF)
for
Geography

Postgraduate Programme
2020



Department of Geography
Cotton University
Panbazar, Guwahati
Assam

PART I

1.1 Introduction

"Geography is concerned to provide accurate, orderly, and rational description and interpretation of the variable character of the earth's surface." - (Richard Hartshorn, 1939)

'Geography' derives from the Greek word – geographia, which means "earth-writing" or the description of the earth, has evolved through the ages, making it difficult to have a concise, universal definition of the subject. The first person to use the word geographia was Eratosthenes, the father of scientific cartography and the first to estimate the circumference of the earth. Egyptian astronomer, mathematician, and geographer Ptolemy (150 CE) also viewed the scope of Geography as 'a view of the whole' earth by mapping the location of places. The scope of the subject is, however, cannot be seen in two separate ontological domains, physical and human. As put forward by British geographer Peter Haggett (1969), geography is the study of the earth surface in the space within which the human population lives. Modern Geography is an all-encompassing discipline finding the relationship between human beings with the physical environment. It provides a spatial perspective on the transformation of the earth surface to the changing society, polity and economy with the spacing of time. The idea of space in geography, which has been the most fundamental geographical concept, has become more explicit in recent times. Philosopher Immanuel Kant (1780) brought the idea of space into geography by defining the subject as a synoptic discipline deducing findings from other sciences and presenting them through the concept of area and space. Today, geography has emerged as a spatial science, bringing spatiality to the current socio-spatial problems. The advancement made in quantification and geospatial technologies has enabled geographers to present multifaceted views of different issues of the real world.

This postgraduate programme in geography is designed to introduce the basic concepts of the subject and to enable the students to analyse and understand the current socio-spatial problems, issues and challenges through the application of disciplinary knowledge. The programme covers fundamental concepts of the subject - the landscape, geographical space, human-nature interaction, geographic world views and policy research. The programme is designed in such a manner that it enables the students to apply geographical knowledge to identify a wide range of contemporary problems and issues and acquire research skills to produce research findings using cartographic knowledge, statistical tools, and geospatial technologies.

1.2 Learning Outcomes-based Approach to Curriculum Planning and Development

The basic objective of the learning outcome based approach to curriculum planning and development is to focus on demonstrated achievement of outcomes (expressed in terms of knowledge, understanding, skills, attitudes and values) and academic standards expected of graduates of a programme of study. Learning outcomes specify what graduates completing a particular programme of study are expected to know, understand and be able to do at the end of their programme of study.

The expected learning outcomes are used to set the benchmark to formulate the course outcomes, programme specific outcomes, programme outcomes and graduate attributes. These outcomes are essential for curriculum planning and development, and in the design, delivery and review of academic programmes. They provide general direction and guidance to the teaching-learning process and assessment of student learning levels under a specific programme.

The overall objectives of the learning outcomes-based curriculum framework are to:

- help formulate graduate attributes, qualification descriptors, programme learning outcomes and course learning outcomes that are expected to be demonstrated by the holder of a qualification.
- enable prospective students, parents, employers, and others to understand the nature and level of learning outcomes (knowledge, skills, attitudes and values) or attributes a graduate of a programme should be capable of demonstrating on successful completion of the programme of study.
- maintain national standards and international comparability of learning outcomes and academic standards to ensure global competitiveness, and to facilitate student/graduate mobility; and
- provide higher education institutions an important point of reference for designing teaching-learning strategies, assessing student learning levels, and periodic review of programmes and academic standards.

1.3 Key outcomes underpinning curriculum planning and development.

The learning outcomes-based curriculum framework is a framework based on the expected learning outcomes and academic standards that are expected to be attained by graduates of a programme of study. The key outcomes that underpin curriculum planning and development include Graduate Attributes, Programme Outcomes, Programme Specific Outcomes, and Course Outcomes.

1.3.1 Graduate Attributes

The disciplinary expertise or technical knowledge that has formed the core of the university courses. They are qualities that also prepare graduates as agents for social good in future. Some of the characteristic attributes that a graduate should demonstrate are as follows:

1. **Disciplinary knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines,
2. **Research-related skills:** A sense of inquiry and capability for asking relevant/appropriate questions, problematising, synthesising and articulating,
3. **Analytical reasoning:** Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others,
4. **Critical thinking:** Capability to apply analytic thought to a body of knowledge,
5. **Problem solving:** Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems,

6. **Communication Skills:** Ability to express thoughts and ideas effectively in writing and orally,
7. **Information/digital literacy:** Capability to use ICT in a variety of learning situations; demonstrate an ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.
8. **Self-directed learning:** Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.
9. **Cooperation/Teamwork:** Ability to work effectively and respectfully with diverse teams,
10. **Scientific reasoning:** Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective,
11. **Reflective thinking:** Critical sensibility to lived experiences, with self-awareness and reflexivity of both self and society.
12. **Multicultural competence:** Possess knowledge of the values and beliefs of multiple cultures and a global perspective,
13. **Moral and ethical awareness/reasoning:** Ability to embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work,
14. **Leadership readiness/qualities:** Capability for mapping out the tasks of a team or an organization, setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, smoothly and efficiently.
15. **Lifelong learning:** Ability to acquire knowledge and skills, including 'learning how to learn', that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of the workplace through knowledge/skill development/reskilling.

1.3.2 Programme Outcomes (POs) for Postgraduate programme

POs are statements that describe what the students graduating from any of the educational programmes should be able to do. They are the indicators of what knowledge, skills and attitudes a graduate should have at the time of graduation.

1. **In-depth knowledge:** Acquire a systematic, extensive and coherent knowledge and understanding of their academic discipline as a whole and its applications, and links to related disciplinary areas/subjects of study; demonstrate a critical understanding of the latest developments in the subject, and an ability to use established techniques of analysis and enquiry within the subject domain.
2. **Understanding Theories:** Apply, assess and debate the major schools of thought and theories, principles and concepts, and emerging issues in the academic discipline.
3. **Analytical and critical thinking:** Demonstrate independent learning, analytical and critical thinking of a wide range of ideas and complex problems and issues.

4. **Critical assessment:** Use knowledge, understanding and skills for the critical assessment of a wide range of ideas and complex problems and issues relating to the chosen field of study.
5. **Research and Innovation:** Demonstrate comprehensive knowledge about current research and innovation, and acquire techniques and skills required for identifying problems and issues to produce a well-researched written work that engages with various sources employing a range of disciplinary techniques and scientific methods applicable.
6. **Interdisciplinary Perspective:** Commitment to intellectual openness and developing understanding beyond subject domains; answering questions, solving problems and addressing contemporary social issues by synthesizing knowledge from multiple disciplines.
7. **Communication Competence:** Demonstrate effective oral and written communicative skills to convey disciplinary knowledge and to communicate the results of studies undertaken in an academic field accurately in a range of different contexts using the main concepts, constructs and techniques of the subject(s) of study
8. **Career development:** Demonstrate subject-related knowledge and skills that are relevant to academic, professional, soft skills and employability required for higher education and placements.
9. **Teamwork:** Work in teams with enhanced interpersonal skills and leadership qualities.
10. **Commitment to the society and to the Nation:** Recognise the importance of social, environmental, human and other critical issues faced by humanity at the local, national and international level; appreciate the pluralistic national culture and the importance of national integration.

1.3.3 Programme Specific Outcomes (PSOs) in Geography

Programme specific outcomes include subject-specific skills and generic skills, including transferable global skills and competencies, the achievement of which the students of a specific programme of study should be able to demonstrate for the award of the degree. The programme specific outcomes would also focus on knowledge and skills that prepare students for further study, employment, and citizenship. They help ensure comparability of learning levels and academic standards across universities and provide a broad picture of the level of competence of graduates of a given programme of study. The attainment of PSOs for a programme is computed by accumulating PSO attainment in all the courses comprising the programme.

PSO1 Basic Concept: Ability to interpret and analyze various concepts and theories of physical and human geography.

PSO2: Understanding Landscape: An understanding of landscape at different levels by examining changing interactions at different spatial and temporal scales.

PSO3: Understanding human-environmental issues: Explain the societal relevance of geographical knowledge and apply it to real-world human-environmental issues. Analyze geographical data and interpret its significance within the context of human-environment relations.

PSO4: Cartographic Knowledge: Display an ability to read and understand maps and topographic sheets to look at the various aspects of the space.

PSO5: Application of Geospatial tools and techniques: Understanding the concepts, principles and applications of geospatial tools and techniques.

PSO6: Use of Statistical Techniques: Use of statistical tools and techniques for precise and objective geographic analysis and interpretation of complex phenomena.

PSO7: Field knowledge and case study-based analysis: Conducting field works to understand the ground reality, spatial patterns and processes. Application of case study based analysis to identify solutions to various Spatio-temporal issues.

PSO8: Applied Dimension: Identification of the critical problems and spatial issues form the core of the modern geography for various applications and decision making, including Resources, Environment & Disaster Management, Land Use Planning, and Urban and Regional Development together with Climate Change Mitigation and Adaptation, etc.

PSO9: Research and Innovation: Use of geographical knowledge to identify a wide range of contemporary problems and issues and acquire research skills to produce a well-researched written work using geographical research tools.

PSO 10: Public Policy: Understand existing public policies of the state and apply and evaluate them in a specific study context.

PSO 11: Critical thinking: Able to identify critical problems and spatial issues related to policy and sustainable development.

PSO 12: Communication Skill: Communicate geographical concepts and data effectively using oral, written, and graphical forms.

1.3.4 Course Level Learning Outcome Matrix

1.3.4.1 Course Outcomes (COs) and Programme Outcomes (POs) matrix

Programme Outcomes, Core Course	701	702	703	704	705	801	802	803	804	805	901	902	903
In depth knowledge	x	x	x	x	X	x	x	x	x	x	x	x	x
Specialised knowledge and skills	x			x	X				x	x			x
Analytical and critical thinking	x	x	x	x		x		x			x	x	x
Research and Innovation	x	x		x	x	x		x	x	x		x	x
Interdisciplinary perspectives			x	x			x	x			x	x	x
Communication competitiveness		x	x		x	x	x	x		x	x	x	x
Career development	x				x	x							x
Teamwork	x			x	x								
Commitment to the society and nation		x	x	x	x	x	x	x					

Programme Outcomes- Special courses	904 SP1	904 SP2	904 SP3	904 SP4	904 SP5	904 SP6	905OE	1001C	1004 DPW	1003 OPE
In depth knowledge	x	x	x	x	x	x	X	x	x	x
Specialised knowledge and skills	x	x		x			X		x	x
Analytical and critical thinking			x		x	x	X	x	x	x
Research and Innovation	x	x	x	x	x	x	X		x	x
Interdisciplinary perspectives			x	x	x		X	x	x	x
Communication competitiveness	x	x	x	x	x	x	X	x	x	x
Career development	x	x					X		x	x
Teamwork										
Commitment to the society and nation									x	x

Course Outcomes (COs) and Programme Outcomes (POs) Matrix – Special Courses

Programme Outcomes- Special courses	1002SP1	1002SP2	1002SP3	1002SP4	1002SP5	1002SP6
In depth knowledge	x	x	x	X	x	x
Specialised knowledge and skills	x	x	x	X	x	x
Analytical and critical thinking			x		x	x
Research and Innovation	x	x	x	X	x	x
Interdisciplinary perspectives			x		x	X
Communication competitiveness	x	x	x	X	x	x
Career development	x	x	x			
Teamwork	x	x				x
Commitment to the society and nation						

1.3.4.2 Course Outcomes (COs) and Programme Specific Outcomes (PSOs) Matrix – Core Course

Programme Specific Outcomes, Core Course	701	702	703	704	705	801	802	803	804	805	901	902	903
Basic Concepts	x	x	x	x	x	x	x	x	X	x	x	x	X
Understanding Landscape	x	x	x	x	x	x	x		X	x	x	x	
Understand human-environmental concerns		x	x	x		x	x	x			x		
Cartographic knowledge				x	x	x				x			
Application and Geospatial tools and techniques	x				x	x				x			
Use of data and statistical tools	x	x		x	x	x	x		X	x	x	x	x
Field knowledge & case study-based analysis				x			x				x		
Applied dimensions	x	x	x	x	x	x		x	X	x	x	x	x
Research and innovations	x	x	x	x	x	x	x		X	x	x	x	x
Public policy		x		x		x	x				x	x	
Critical thinking		x	x	x			x				x	x	x
Communication skills	x	x	x	x	x	x	x	x	X	x	x	x	x

Course Outcomes (COs) and Programme Specific Outcomes (PSOs) Matrix – Special Courses

Outcomes	904 SP1	904 SP2	904 SP3	904 SP4	904 SP5	904 SP6	905OE	1001C	1004 DPW	1003 OPE1
Basic Concepts	x	x	x	x	x	x	X	x	x	x
Understanding Landscape	x	x	x	x	x		X	x	x	x
Understand human-environmental concerns			x		x	x	X	x	x	x
Cartographic knowledge	x	x	x	x	x	x			x	x
Application and Geospatial tools and techniques	x	x							x	x
Use of data and statistical tools		x	x	x	x	x			x	x
Field knowledge & case study-based analysis			x			x	X	x	x	
Applied dimensions	x	x	x	x	x	x		x	x	x
Research and innovations	x	x	x	x	x	x	X	x	x	x
Public policy	x		x		x	x	X		x	x
Critical thinking			x			x		x	x	x
Communication skills	x	x	x	x	x	x	X	x	x	x

Course Outcomes (COs) and Programme Specific Outcomes (PSOs) Matrix – Special Courses

Outcomes	1002SP1	1002SP2	1002SP3	1002SP4	1002SP5	1002SP6
Basic Concepts	x	x	x	X	x	x

Understanding Landscape	x	x	x	X	x	x
Understand human-environmental concerns	x		x		x	x
Cartographic knowledge	x		x	X	x	x
Application and Geospatial tools and techniques	x	x				
Use of data and statistical tools	x	x	x	X	x	x
Field knowledge & case study-based analysis			x		x	x
Applied dimensions	x	x	x	X	x	x
Research and innovations	x	x	x	X	x	x
Public policy	x		x		x	
Critical thinking			x			x
Communication skills	x	x	x	X	x	x

1.4 Teaching-learning process

The department of Geography, Cotton University has student-centric teaching-learning pedagogies to enhance the learning experiences of the students. All classroom lectures are interactive in nature, allowing the students to have meaningful discussions and question and answer sessions. Apart from the physical classes, lectures are also held in online mode where students can have doubt clearing and discussions with the teachers. Most of the teachers use ICT facilities with power-point presentations, e-learning platforms and other innovative e-content platforms for student-centric learning methods.

The Department has adopted participative teaching-learning practices, which includes seminars, presentations, and group discussions. These participative teaching-learning practices are included in the curricula of almost all the courses. Apart from these, exposure visits, special lectures by invited experts, workshops, and National/International seminars are held to augment knowledge, encourage innovative ideas and expose the students to global academic and research advancement.

The short-term projects, research projects, assignments and field works, which are the integral components of all the courses, enable the students to solve practical problems. Students are also being engaged in sample surveys, data collection and analysis works of the in-house and external research projects for acquiring experiential learning. The laboratories of the department offer hands-on learning experiences to the students.

1.5 Assessment methods

A variety of assessment methods that are appropriate to the discipline are used to assess progress towards the course/programme learning outcomes. Priority is accorded to formative assessment. Progress towards achievement of learning outcomes is assessed using the following: closed-book examinations; problem-based assignments; practical assignment; laboratory reports; individual project reports (case-study reports); team project reports; oral

presentations, including seminar presentation; viva voce interviews; computerised testing and any other pedagogic approaches as per the context.

PART II

Structure of Post-Graduate programme in Geography

I. Outline of the courses under Choice Based Credit System:

The Postgraduate programmes consist of four semesters with minimum credits required for the complete programme being 84 while the M.C.A. programme will be of six semesters with minimum credit requirement being 118.

Each course in a programme will be from one of the following categories:

1. Core Course (Core): A course that should compulsorily be studied by a candidate as a core requirement is termed a Core Course. Each core course is of 4 credits.

2. Lab Course (LAB): A Lab (Laboratory) course is a compulsory course in the first two semesters of the M.Sc. programme where a major part of the study involves laboratory work. Each Lab course is of 4 credits.

3. Elective Course: A course that can be chosen from a pool of courses and which may extend the discipline/subject of study or provides exposure to some other discipline/subject, or which enhances the student's proficiency or skill is termed an Elective course.

(i) **Special Course (SPL):** A course within the parent department that will lead to specialized knowledge and expertise. Each SPL course is of 5 credits.

(ii) **Open Elective (OPE):** An elective course offered under the main discipline/subject of study is an Open Elective and may be offered to students of other disciplines. A student from a given discipline will be eligible to take one open elective in the third semester and one in the fourth semester. Each OPE course is of 4 credits.

(iii) **Skill Enhancement Course (SEC):** These courses may be chosen from a pool of courses designed to provide skill-based knowledge and should ideally contain both theory and lab/hands-on/training/fieldwork. The primary purpose is to provide students with lifeskills in hands-on mode to increase their employability. Each SEC course is of 2 credits.

4. Practical/Tutorials: A practical or tutorial component (or both) is to be provided with every core and special paper/open elective paper.

5. Dissertation/Project Work (DPW): A course designed for students to acquire special/advanced knowledge that they study on their own with advisory support by a teacher/faculty member is a dissertation/project work. A DPW course is of 6 credits.

- The credits for a course will be of the structure L+T+P, where L, T and P stand for lecture, tutorial and practical respectively.
- Each 4 credit course with practical is of the pattern $3+0+1=4$ and for a 4 credit course without practical, the pattern is $3+1+0=4$.
- For the 5 credit courses with practical the credit division will be either $3+0+2=5$ or $3+1+1=5$ and will be decided by the department offering that course. For a course without practical, the structure will be $4+1+0=5$.

- The credit division for the Lab course of 4 credits will be 0+0+4=4. For certain disciplines, the 4 credits may be divided between fieldwork and laboratory.
- Each Open Elective OPE course will be open to students from other disciplines subject to requirements of previous knowledge required to take that course.
- A student may choose an OPE course from his/her own discipline or any other discipline. The decision of whether an OPE course may be offered to students of other departments as well as students of the parent department will be taken by the department and the course designed accordingly.
- For computation of workload, the mechanism adopted will be:

1 credit = 1 theory period of 1 hour duration per week.

1 credit = 1 tutorial period of 1 hour duration per week.

1 credit = 1 practical period of 2 hours duration per week.

II. Distribution of Courses and Credits

Postgraduate Programme (Science)

A student in the M.Sc. programme will take the following minimum number of courses in different categories of courses:

Table 1: Credit distribution for courses: M.Sc.

Category	Number of courses	Credits for each course	Total Credits
Core	12	4	48
LAB	2	4	8
SEC	2	2	4
SPL	2	5	10
OPE	2	4	8
DPW	1	6	6
			84

The distribution of credits and courses in each of the four semesters for the M.Sc. programme will be according to the following scheme:

Sem	Core	LAB	SEC	SPL	OPE	DPW	Credit
I	C1(4) C2(4) C3(4) C4(4)	LAB1(4)	SEC1(2)				22
II	C5(4) C6(4) C7(4) C8(4)	LAB2(4)	SEC2(2)				22
III	C9(4) C10(4) C11(4)			SPL1(5)	OPE1(4)		21
IV	C12(4)			SPL2(5)	OPE2(4)	DPW(6)	19
Credit	48	8	4	10	8	6	84

COTTON UNIVERSITY

DEPARTMENT OF GEOGRAPHY

Postgraduate Syllabus

COURSE STRUCTURE OF GEOGRAPHY (POSTGRAGUATE PROGRAMME)

CourseCode	Subject Title	L+T+P
Semester I		
GPH 701C	Geomorphology	3+0+1
GPH 702C	Population and Social Geography	3+1+0
GPH 703C	Geographical Thought	3+1+0
GPH 704C	Geography of Development of N.E India	3+0+1
GPH 705L	Cartographic Methods	0+0+4
Semester II		
GPH801C	Climatology	3+1+0
GPH802C	Regional Geography of Assam	3+1+0
GPH803C	Cultural and political Geography	3+1+0
GPH804C	Quantitative Methods in Geography	3+0+1
GPH805L	Geoinformatics	0+0+4
GPH 806 SEC	Fundamentals of geographical information system	1+0+1
Semester III		
GPH901C	Settlement and Urban Geography	3+1+0
GPH902C	Geography of Development and Economic Activity	3+1+0
GPH903C	Research Methodology	3+0+1
GPH905 OE	Geography of Environment and Sustainability	3+1+0
GPH904 SP 1	Drainage Basin and Hydrology	2+1+2
GPH904 SP 2	Remote Sensing Principles and Techniques	2+1+2
GPH904 SP 3	Basis of Regional planning and development	2+1+2
GPH904 SP 4	Basic foundation of Cartography	2+1+2
GPH904 SP 5	Agricultural Geography	2+1+2
GPH904 SP 6	Conceptual and Theoretical Framework of Social Geography	2+1+2
Semester IV		
GPH1001C	Contemporary issues in Human Geography	3+1+0
GPH1002 SP 1	Channel Form and Processes	2+1+2
GPH1002 SP 2	Principles & Application of GIS and GPS	2+1+2
GPH1002 SP 3	Regional and Global Perspective of Development	2+1+2
GPH1002 SP 4	Modern Cartographic Techniques	2+1+2
GPH1002 SP 5	Agricultural Geography of India	2+1+2
GPH1002 SP 6	Social Geography of India	2+1+2
GPH1003 OE 1	Geography of Tourism	3+1+0
GPH1004 DPW	Dissertation in Special Paper	0+2+4

Course Code: GPH 701C

Course Title: Geomorphology (4 Credits, L+T+P = 3+0+1)

This course explores aspects of physical landform and geomorphological processes; will build up theoretical, conceptual, and practical foundation of geomorphology. After the completion of the course, the students will have the ability to understand the changing pattern and processes of physical landscape and relate features at a locale. The practical of the course are designed to learn the techniques of geomorphological analysis. At the end the course student will learn the importance of geomorphology in understanding the physical world and the developments in contemporary period.

The specific learning outcomes are -

CO1: Understand theoretical, practical, and conceptual foundation of geomorphology.

CO2: Use the techniques of geomorphological analysis and relate in man-nature interactions.

CO3: Design Maps on relief by selecting proper geomorphic techniques of representation.

Unit	Content	No. of lectures
1	Nature of geomorphology, concepts of steady state, dynamic equilibrium, threshold; systems approach in geomorphology.	10
2	Trends in geomorphological study- quantitative geomorphology, process geomorphology, structural geomorphology, climatic geomorphology and morphogenetic regions, applied geomorphology: palaeo- geomorphology, hydro-geomorphology and environmental geomorphology.	10
3	Slope – elements, classification; theories of slope development – slope decline, slope replacement and parallel retreat	8
4	Agents of landform developments, processes of erosion, transportation, and deposition by running water, glacier, wind, and sea waves; resultant landforms.	12
5	Drainage types and patterns; concept of drainage basin, long profile and cross profiles of basin.	8
7	Practical- Longitudinal and cross profiles of drainage basin, longitudinal profile of river, hypsometric curve and hypsometric integral; slope analysis: Wentworth's method; slope measurement using instruments; determination of point attributes- altitude, gradient, aspect, etc. of random points of a basin; frequency distribution of altitude and gradient of a basin.	1 credit

Reading List:

- Bloom A.E., 2003: *Geomorphology: A Systematic Analysis of Late Cenozoic Landforms*, Prentice-Hall of India, Englewood Cliffs, N. J.
- Embelton C. Brunsden D. and Jones, DKC (ed)1978: *Geomorphology, Present Problems and Future Prospects*, Oxford University Press, London
- Embelton, C and Thorns J. 1979: *Process in Geomorphology*, Arnold Heinemann, First Indian Edition, 1982
- Goudie, A.(ed) 1990: *Geomorphological Techniques*, Routledge, London, and New York
- Gregory K. J. and Lewin J. 2014: *The Basics of Geomorphology*, Sage, L. A., London, New Delhi, Singapore, Washington D.C.
- Hart, M. G. 1986: *Geomorphology: Pure and Applied*, Allen and Unwin (Publishers) Ltd. London
- Holmes, A. 1968: *Principles of Physical Geology*, Nelson, London
- Monkhouse, F. J. and Wilkinson H.R. 1973: *Maps and Diagrams*, Methuen, London
- Pitty, A.F. 1982: *The Nature of Geomorphology*, Methuen, London and New York
- Sharma V. K. 1986: *Geomorphology, Earth Surface Processes and Forms*, Tata-McGraw Hill, New Delhi
- Sharma V. K. 2010: *An Introduction to Process Geomorphology*, CRC Press
- Singh, Savindra, 2007: *Geomorphology*, PrayagPustakBhawan, Allahabad
- Steers, J. A. 1958: *The Unstable Earth*, Methuen, London
- Thornburry, W.D., 1968: *Principles of Geomorphology*, Wiley Eastern Reprint 1984
- Waugh, D. 2002: *An Introduction to Physical Geography*, Nelson Thornes, U.K.
- Young, A. 1972: *Slope*, Longman, New York

Course Code: 702C

Course Title: Population and Social Geography

Total Credits: 4 (L+T+P= 3+1+0)

This course teaches the wide domain of population studies and social geography by making the students familiar with the concepts, theories, data, and indicators; and enable the students to study various parameters related to population in different spatial context. Unsustainable population growth or overpopulation which is fallout of many factors; is the prime concern in contemporary world leading to several negative consequences as revealed by certain outcome indicators. Population resource relationships – local as well as global food security and basic provisioning for decent living thus are the prime goals of a welfare state and ensure inclusive development. A component of the course relates and covers developments in the field of social geography, the structure of society, and introduces the gender perspectives to understand inclusive development process.

After completion of the course the students will be able to:

- CO1: Understand basic concepts, and theories on population geography.
- CO2: Locate the database and measures of population and development.
- CO3: Analyse philosophical and methodological development of Social Geography
- CO4: Evaluate the concepts of gender attributes with vivid mental maps.

Unit	Content	No of
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		lectures
1	Defining the field of population geography, conceptual basis of over population, under population, optimum population, population explosion, population pressure; world population region.	8
2	Population growth: trends (global, India), factors and determinants, spatial pattern; population composition: spatial pattern in age-sex, rural-urban, religions, language, literacy and literacy transitions; population dynamics: fertility & mortality, fertility and mortality transitions, migration- theories and laws, types, and consequences	10
3	Population – resources relationship, population resource region, global and local food security issues.	8
4	Philosophical and methodological development of social geography, Contemporary trends in social geography, social structure, social process, social plurality Social segregation & social exclusion	10
5	Gender perspective in social geography, gender discrimination, gender gaps in social and public life, role of education and occupation in bridging gender gap. space and spatial dimensions of gender	12

Reading List:

- Ahmad, A. (ed), 1993: *Social Structure and Regional Development: A Social*
- Ahmad, A., 1999: *Social Geography*, Rawat Publication, Jaipur and New Delhi.
- Ahmad, A., *et. Al*(eds), 1997: *Demographic Transition: The Third Third-World Scenario*, Rawat Publications, Jaipur, and New Delhi.
- Chandna, R. C., 1986: *A Geography of Population*, Kalyani Publishers, New Delhi.
- Clarke, J. I., 1972: *Population Geography*, Pergamon Press, Oxford.
- *Geography perspective*, Rawat Publication, Jaipur.
- Haggett, P., 1972: *Geography: A Modern Synthesis*, Harper & Row, New York.
- Noble, A. G. and Dutta, A. K. (eds): *India: Cultural Pattern and Processes*, West View Press, Colorado.
- Peters, G. L. and Larkin, R. P., 1979: *Population Geography: Problems, Concepts and Prospects*, Kendall/ Hunt Iowa.
- Robinson, H., 1981: *Population and Resources*, Macmillan Press, London.
- Sandram, K. V. and Nangia, S., (eds): *Population Geography*, Heritage Publishers, New Delhi. Inc., New York.
- Srinivas, M.N., 1986: *India: Social Structure*, Hindustan Publishing Corporation, Delhi.
- Taylor, Griffith, 1949: *Urban Geography*, Methuen, London.
- Trewartha, G. T., 1969: *A Geography of Population: World Pattern*, John Wiley & Sons.
- Woods, R., 1979: *Population Analysis in Geography*, Longman, London.
- Zelinsky, W., 1966: *A Prologue to Population Geography*, Prentice-Hall, Englewood Cliffs, New Jersey.

Course Code: GPH 703 C

Course Title: Geographic Thought**Total Credit: 4 (L+T+P= 3+1+0)**

This course in addition to an outline on chronology on development of geographical thought provides a clear picture on present development of world geography. The course discusses certain conceptual frames, laws, theories, models as well as debates and approaches involved in studies of geography. In the process the course provides a sound philosophical foundation to study geography. Some of the contemporary discussion on Gender and Post-modernism are also covered in this course.

Specific learning outcomes of the course are -

CO1: Understand the developments in the field of geography including the contemporary discussion and debates.

CO2: Identify critical issues of development and analysis.

CO3: Explanations of geography and spatial analysis with a sound theoretical and philosophical foundation.

Unit	Content	No. of lectures
1	Evolution of geographic thought; an outline of the chronology of geographical development	6
2	Conceptual structure in geography: spatial distribution, areal association, location, regionalisation, and interaction	9
3	Contemporary tradition in human geography: Schaefer-Hartshorne debate; quantitative revolution, behavioural geography	6
4	Humanistic approaches- idealism, phenomenology, existentialism; positivism, pragmatism, functionalism, realism, Marxism, and feminism	9
5	Explanation in geography: laws and theories; models and system analysis	8
6	Spatial analysis: history and concept of space and spatial organisation	6
7	Gender geography, post-modern geography	4

Reading list:

- Abler, R. A., & Gould, P. P. (1971). *Spatial Organisation: The Geographers View of the World*. Englewood Cliff: Prentice Hall.
- Adhikari, S. (2001). *Fundamentals of Geographical Thought*. Allahabad: Chaitanya.
- Bunge, W. (1962). *Theoretical Geography, Lund Studies in Geography*. Lund: C.W.K. Glcerup.
- Chorley, R. J., & Hagget, P. (1967). *Models in Geography*. London: Methuen.
- Daniels, P. e. (2003). *Human Geography, Issues for the 21st Century*. India: Pearson Education.
- Dickinson, R. E. (1969). *The Makers of Modern Geography*. Ludhiana: Lyall Book Depot.
- Dikshit, R. D. (2003). *Geographical Thought, A Contextual History of Ideas*. New Delhi: Prentice Hall of India.
- Dikshit, R. D. (1994). *The Art and Science of Geography*. New Delhi: Prentice Hall of India.
- Hagget, P. (1967). *Locational Analysis in Human Geography*. London: Butler and Tanner.

- Hartshorne, R. (1959). *Perspective on the Nature of Geography*, Indians edition. Jodhpur: Scientific Publishers.
- Hartshorne, R. (1939). *The Nature of Geography*. Chicago: Rand Mckully.
- Harvey, D. (1969). *Explanation in Geography*. New York: St. Martin Press.
- Johnstone, R. J. *The Dictionary of Human Geography*. Basil, Blackwell: Oxford.
- Verma, J. (2008). *Human Geography*. New Delhi: Gnosis.

Course Code:GPH 704C

Course Title: Geography of Development of N.E India

Total Credit: 4 (L+T+P=3+0+1)

This course will help gain a comprehensive idea of Northeast India from a geographical perspective. The course is aimed to familiarize the students with the physical and human aspects and synthesise and develop the idea of regional dimension. The developments in economic sectors in recent times and prospective regional cooperation with ASEAN with adoption of Act East policy are also discussed in this course and ASEAN.

The following outcomes will be achieved:

CO1: Understand the landscape, resources, and state of development of Northeast region.

CO2: Analyse the determinants of development in social and economic sectors of the region.

CO3: Evaluate policies and programme on development.

Unit	Contents	No. of lectures
1	Location and strategic significance of NE India; physical characteristics and their relation to development: relief, drainage, climate, soil and vegetation and biodiversity.	12
2	Natural resources, their utilization and development: coal, petroleum, natural gas, water and forests in Northeast India.	8
3	Population and development: population growth, composition and distribution, migration, population characteristics and their socio-economic implications, level of urbanization and development inequalities.	10
4	Agriculture and development: characteristics and problems of agriculture, agricultural modernization, and strategies for future development; constraints of industrial development; problems and prospects of tourism, development in transport and communication system.	10
5	Spatial pattern of socio-economic development and backwardness (state level), and strategies for future development; Socio-economic and trade relation with ASEAN countries.	8
6	Practical: -Thematic mapping of spatial pattern of population characteristics in Northeast India (State level) and Assam (District level); determination of level of infrastructural development in North East India using simple composite index; analysis of connectivity and centrality of transport networks in North East India; choropleth mapping of cropping intensity of N.E. India	1 credit

Reading List:

- Bhagabati, A. K. *et al*, 2001: *Geography of Assam*, Rajesh Publications, New Delhi.
- Bhatt, L. S., 1973: *Regional Planning in India*, Statistical Publishing Society, Calcutta.
- Das, H. P., 1971: *Geography of Assam*, NBT, New Delhi.
- Das, M. M., 1984: *Peasant Agriculture in Assam*, Inter India Publications, New Delhi.
- Dutta Ray, B., et. al (eds), 2000: *Population, Poverty and Environment in North East India*, Concept Publishing Co., New Delhi.
- Dhar, P. K., 1988 (2nd Edition): *The Economy of Assam*, AshomiPrakashani
- Misra, et. al, 1974: *Regional Development Planning in India- A Strategy*, Institute of Development Studies, Mysore.
- Bhattacharyya N.N.2009: *Northeast India: A systematic Geography*, Rajesh publication, Delhi.
- Taher M. and Ahmed, P., 2000: *Geography of Northeast India*, Mani-Manik Prakash, Guwahati.
- Taher M. and Ahmed P. 2005: *Assam: A geographical profile*, Mani-Manik Prakash, Guwahati.

Course Code: GPH 705 L**Course Title: Cartographic Techniques****Total Credit: (L+T+P= 0+0+4)**

This practical course will help the students to gain a wide-ranging idea of practical Cartographic techniques and methods. The course aims to bring into the light the students with the medium to advanced level of cartographic tools and techniques. Preparation of map and diagram using all the socioeconomic, climatic, and physiographic parameters are includes so that the students get introduced to all kinds of data and data representation tolls. Inclusion of various projections enables the students to have idea about the challenges regarding map preparation in higher accuracy. The field survey tools and techniques will make the students highly skilled and be able to provide a very wide range of hands-on practical experience on the equipmentused for field survey and map making.

The learning outcomes are -

CO1: Understand the various tools and techniques of map making.

CO2: Apply physical field surveying methods with instrument.

CO3: Analyse and interpret socio-economic, climatic, topographic data.

CO4: Design socio-economic and physical maps.

Unit	Content	No of practical classes
1	Drawing of complex thematic maps; measurement of area of a part of topographical map / drainage basin using digital planimeter; map enlargement and reduction using pantograph	10

2	Analysis and interpretation of climatic data- isohyet map, variability map, water surplus and deficiency graph, rainfall dispersion graph.	10
3	Analysis and interpretation of topographic Data- Hachuring and Block diagram, Drainage density map, dissection index map,	10
4	Principles of construction of graticules and their properties, uses & limitation- (i) Lambert's conical equal-area projection; (ii) Conical projection with two standard parallels; (iii) Zenithal gnomonic projection (equatorial case) (iv) Mercator's Projection (v) Mollweide's Projection.	15
5	Prismatic compass - open traverse survey; Dumpy level - preparation of contour map of any selected terrain; Auto level - preparation of road profile; Theodolite - determination of height of an inaccessible object, closed traverse survey using independent coordinate method	15

Reading List:

- Clendinning, J., 1960: *Principles of Surveying* 2nd edition.
- Curtis, H., 2000: *The GPS Accuracy Improvement Initiative*, GPS World, June 2000.
- Gopi, S., 2005: *Global Positioning System Principles and Applications*, Ta McGraw Hill, New Delhi.
- Kanetkar, T. P. and Kulkarni, S. V., 1972: *Surveying and Levelling [Part-I &II]*, VidyarthiGrihaPrakashan, Pune.
- Langley, R. B., 1991: *The GPS Receiver – An Introduction*, GPS World, 2(1). Operation Manual of Placom Digital Planimeter.
- Sandover, J. A., 1961: *Plane Surveying*, Arnold.
- Saha, P. K. and Basu, P., 2010: *Advanced Geography Practical – A Laboratory Manual*, Books and Allied (P) Ltd., Kolkata.

Course Code: 801 C
Course Title: Climatology
Total Credit: 4 (L+T+P= 3+1+0)

This course introduces the students to the scientific study of climate and covers all basic concepts and phenomena. On applied part, this course helps to have better understanding on the atmospheric condition with application of climatic data that influence the decision-making process on climate change and vulnerability context, and adaptation on ecology, economic and social sectors fronts.

Learning outcome are

CO1: Understand the basic concept of climate and weather, their phenomena and parameters.

CO2: Recognise the present critical problems of global climate and interpret those in terms of human activities.

CO3: Analyse the use of climatic database on different human developmental activities

Unit	Contents	No. of lectures
1	Atmospheric energy and terrestrial radiation: solar radiation; mechanism of heat transfer; distribution of solar radiation over the earth; global radiation budget; urban heat island	8
2	Atmospheric equilibrium: stability and instability	4
3	Climatic disturbances: cyclone, anticyclone, cloud burst, drought, thunderstorms, El Nino and La Nina phenomena; Jet stream, mechanism of development of monsoon and its distribution.	14
4	Classification of climate: schemes of Koeppen's and Thornthwaite.	6
5	Applied climatology: data collection, archiving, accessing, interpretation and generation of climatic information specially for water balance studies, soils, agriculture activities, house types and health.	8
7	Spatio-temporal perspectives on global climate change: causes, impacts, vulnerabilities and mitigation strategies	8

Reading List:

- Barry R. G. and Carleton A. M., 2001: *Synoptic and Dynamic Climatology*, Routledge, UK.
- Barry R. G. and Corley R. J., 1998: *Atmosphere, Weather and Climate*, Routledge, New York.
- Batten L. J., 1979: *Fundamentals of Meteorology*, Prentice-Hall Inc. Englewood Cliffs, New Jersey
- Boucher K., 1975: *Global Climates*, Halstead Press, New York.
- Critchfield H. J., 1987: *General Climatology*, Prentice-Hall of India, New Delhi.
- Griffith, J.F., 1966: *Applied Climatology*, Oxford university Press
- Lal, D.S., 2002: *Climatology*, Chaitanya Publishing House, Allahabad
- Lutgens F. K., Tarbuck E. J. and Tasa D., 2009: *The Atmosphere: An Introduction to Meteorology*, Prentice-Hall, Englewood Cliffs, New Jersey.

- Oliver J. E. and Hidore J. J., 2002: *Climatology: An Atmospheric Science*, Pearson Education, New Delhi.
- Singh, S. 2007: *Climatology*, Sharada Pustak Bhawan, Allahabad.
- Thompson D. R. and Perry A. (eds.), 1997: *Applied Climatology: Principles and Practice*, Routledge, USA and Canada.
- Trewartha G. T. and Horne L. H., 1980: *An Introduction to Climate*, McGraw-Hill.

Course Code: 802 C

Course Title: Regional Geography of Assam

Total Credit: 4 (L+T+P= 3+1+0)

This course will help gain a comprehensive idea of Assam from a geographical perspective. The course is aimed to familiarize the students with the physical and human aspects and synthesise and develop the idea of regional dimension. Certain critical developments in the economic sectors, population and geo-politics considering the ecological are discussed.

The following outcomes will be achieved:

CO1: Understand the spatial perspective of landscape, demography, and resource distribution.

CO2: Examine the development of natural resources and locate the strategy and action plan in the context of natural resources utilization and conservation.

CO3: Locate the agricultural and industrial sectors and their development in the state.

CO4: Analyse the geo-political and immigration issues of the state.

Unit	Content	No. of lectures
1	Assam as a geographical entity: historical evolution, relief, drainage, climate and soil.	8
2	Natural resources: their utilization and development; coal, petroleum, natural gas, water, forests resources in Assam, biodiversity of Assam: status, strategy and action plan for conservation	14
3	Types of agricultural practices: major agricultural products, industries: forest based, agro based and mineral based, cottage and small-scale industries. tourism industry, problems, and prospects of industrial development in Assam	14
4	Population composition, population dynamics, immigration issues in Assam, trend and process of urbanization	10
5	Geopolitical issues in Assam	2

Reading List:

- (2003). *20-Year Perspective Tourism Plan For the State of Assam*. Final Report, Ministry of Tourism and Culture Department of Tourism Market Research Division, Department of Tourism, Government of India.
- Bhagabati, A. K., Kar, B. K., & Bora, A. K. (2012). *Geography of Assam*. Rajesh Publications.
- Bhattacharya, N. N. (2011). *Assam a systematic geography*. Rajesh Publications.

- Chutia, S. (2015). Prospects and Problems of Tourism Industry in Assam. *International Journal of Innovative Research In Science, Engineering and Technology*, 4 (2nd), 633-638.
- Deb, B. J., & Ray, B. D. (2016). *Changing Agricultural Scenario in North East India*. New Delhi: Concept Publishing Company.
- Hazarika, J. (1996). *Geopolitics of North East India : A Strategical Study*. Gyan Publishing House.
- Saikia, A. (2011). *Forests and Ecological History of Assam, 1826-2000*. Oxford University Press.
- Sen, D. S. (2016). *A socio-cultural and economic history of Assam*. Mahabir Publications.

Course Code: GPH 803C

Course Title: Cultural and Political Geography

Total Credits: 4 (L+T+P=3+1+0)

In addition to introducing the themes of cultural geography and the developments in this domain, this course tries to understand the rich cultural diversity of India. The themes of contemporary concerns and discussion – cultural ecology, indigenous knowledge system, community based sustainable development and cultural pluralism are given space in this course. On political geography part the often-discussed points on politics over world resources, geo-political problems in India's northeast region and public policy and finance in a federal country like India are discussed.

Learning outcome of this course are -

CO1: Understand the themes under the domain of cultural and political geography

CO2: Locate the theme in contemporary context and acquire capability for critical analyse

Unit	Content	No. of lectures
1	Meaning of culture, development of cultural geography, themes in cultural geography	6
2	Cultural diffusion, India as a linguistic area, religious groups in India, ethnicity in contemporary India	8
3	Theory of cultural ecology; indigenous knowledge and natural resource management, challenges to community based sustainable development	6
4	Capitalism and culture; cultural pluralism and dilemmas of justice.	4
5	Nature of administrative areas and geography of public policy and finance; geography and federalism; electoral studies in political geography	8
6	Politics of world resources; geopolitical world views.	6
7	Geopolitical problems of India; geopolitical problems of Northeast India with special reference to the changing political map, interstate issues, insurgency, conflict resolution, demands and emergence of new states	10

Reading list: (Cultural Geography)

- Ahmed, A. (1999). ***Social Geography***. Delhi: Rawat Publications.
- Anderson, J. (2010). ***In Understanding Cultural Geography: Places and Traces***. New York: Routledge.
- Anderson, K., Domosh, M., Pile, S., & Thrift, N. (2002). ***Handbook of Cultural Geography***. Sage Publications.
- BijuKumar, V. (2013). ***Social Exclusion and Ethnicity in Northeast India***. *The NEHU Journal* , 19-35.
- Danda, A. K. (1991). ***Ethnicity in India***. New Delhi: Inter-India Publications.
- Deveau, M. ***Cultural Pluralism and Dilemmas of Justice***, Cornell University Press, London, 2000
- Duncan, J., Schein, R. H., & Johnson, N. C. (2004). ***A Companion to Cultural Geography***. Blackwell Publishing Ltd.
- Jackson, R. H., & Hudman, L. E. (1990). ***Cultural Geography***. New York: West Publishing Company.
- Kivinen, O., Mesikammen, J., & Tokila, T. M. (2016, February 11). ***ResearchGate***. Retrieved from <http://www.researchgate.net/publication/263594004>
- Leach, M. M., & Scoones, I. (1997). ***Challenges to community based sustainable development: dynamics, entitlements and institutions***. *IDS Bulletin*, 28 (4), 4-14.
- Noble, A. G., & Dutt, A. K. (1982). ***India: Cultural Pattern and Processes***. Colorado: West View Press.
- Sassen, S., & Lynd, R. S. (2006). ***Territory, Authority, Rights: From Medieval to Global Assemblages***. Princeton University Press.
- Sauer, C. O. (1963). ***Land and Life***. Berkley: University of California Press.
- Sennett, R. (2006). ***The Culture of the New Capitalism***. New Haven & London: Yale University Press.
- Singh, S., Youssouf, M., Malik, Z. A., & Bussmann, R. W. (2017). Sacred Groves: Myths, Beliefs, and Biodiversity Conservation-A Case Study from Western Himalaya, India. ***International Journal of Ecology*** .
- Steward, J. (1955). ***The Concept and Method of Cultural Ecology***. University of Illinois Press.
- Zelinsky, W. (1973). ***The Cultural Geography of America***. Princeton: Princeton University Press.

Political Geography

- Chopra, G. (2006). ***Political Geography***. New Delhi: Commonwealth Publishers.
- Dikshit, R. D. (1996). ***Political Geography: A contemporary Perspective***. New Delhi: Tata Mc Graw Hill.
- Diksit, R. D. (1999). ***Political Geography: A Century of Progress, Sage***,. New Delhi: Sage.
- Mohanty, G. S. (2005). ***Political Geography***. Delhi: ISHA Books.
- Pounds, N. J. (1972). ***Political Geography***. New York: Mc Graw Hill.
- Sukhwai, B. L. (1985). ***Modern Political Geography of India***. New Delhi: Sterling Publishers.

Course Code: GPH 804C

Course Title: Quantitative Methods in Geography

Total Credits 4 (L+T+P =3+0+1)

Adhering to importance of quantitative approach in geographical studies this course teaches some basic statistics often applied in the discipline of geography.

Learning outcomes of this course are

CO1: Understand significance of quantitative approach in geographical studies.

CO2: Locate rationality behind the use of the basic statistical concepts in geography.

CO3: Apply certain statistical techniques to analyse geographical data.

Unit	Content	No. of lectures
1	Significance of quantification in geographical analysis; nature and types of geographical data; geographical data matrix.	4
2	Time series analysis- moving average and least square method	5
3	Regression analysis: simple regression, regression line, regression residuals, standard error estimate; non-linear regression-exponential and power function types with reference to distance decay, spatial interaction and gravity potential types; multiple regression and correlation.	12
4	Theoretical distribution – normal, binomial and poisson	6
5	Measures of spatial distribution: point distribution – nearest neighbour analysis, chi square, mean centre; line distribution- network analysis; areal distribution – Lorenz curve, location quotient	12
6	Hypothesis Testing: parametric and non-parametric test- t- test, f-test, ANOVA, chi square.	9
7	Practical: Application of Moving Average method, simple regression analysis, nonlinear regression analysis- allometric growth and exponential curve (population growth), Chi square and t-test in geographical data; Use of MS Excel for regression line.	1 credit

Reading List:

- Berry B.J.L and Marble D. F. (eds) 1968: *Spatial Analysis- A reader in Geography*, Prentice Hall, Englewood Cliffs, N. J.
- Ebdon D. 1977: *Statistics in Geography: A practical Approach*, (2nd edition 1991) Wiley
- FitzGerald, B. P. *et al* 1974: *Science in Geography Series*, Oxford University Press
- Gregory, S. 2014: *Statistical Methods and the Geographer*, Routledge
- Hammond R. and McCullagh P. S., 1978: *Quantitative Techniques in Geography*, Oxford University Press
- Johnston R.J. 1973: *Multivariate Statistical Analysis in Geography*, Longman, London
- King L.J. 1969: *Statistical Analysis in Geography*, Prentice Hall
- Mahmood A., 1977: *Statistical Methods in Geographical Studies*, Concept
- Paul, S. K. 1998: *Statistics for Geoscientist*, Tata McGraw Hill, New Delhi
- Robinson, G. M. 1998: *Methods and Techniques in Human Geography*, John Wiley & Sons, Chichester
- Rogerson, P 2006: *Statistical Methods for Geography* (2nd Edition), Sage Publications, London, New Delhi
- Wheeler, D. Shaw, G., Barr, S. 2013: *Statistical Techniques in Geographical Analysis* (3rd edition) Routledge

Course Code: GPH 805 L

Course Title: Geoinformatics
Total Credits: 4 (L+T+P, 0+0+4)

This is a complete practical course on Geoinformatics with good number of hands-on exercises are included. Starting from the basic knowledge of geo referencing and digitizing to in depth practical knowledge of digital image processing are included in this course. Along with Remote sensing and GIS, one very sophisticated mapping tool DGPS is also covered. Which can enable learner with good understanding of precision surveying and mapping of the earth surface. Analysis of Digital Elevation model also enhance the learner's capability to interpret the terrain parameters.

The following are the learning outcomes-

CO1: Demonstrate hands on experience and expertise of the practical knowledge on all the elements of geoinformatics, viz. GIS, Remote Sensing, GPS.

CO2: Develop expertise in handling advanced surveying tools like DGPS for map making.

CO4: Design maps with different image processing tools and techniques.

Unit	Content	No. of practical classes
1.	- Georeferencing a part of topographical maps by using standard GIS software package. - Extraction of point, line, and polygon features from topographical maps - Digitization of administrative boundaries (India/ North-eastern India/ Assam) as polygons and adding any two socio-economic attributes and preparing two thematic maps	18
2.	- Satellite remote sensing: understanding the principles, EMR interaction with atmosphere and earth surface, Landsat and IRS satellite data products and applications, visual interpretation keys - Introduction to online platforms for generation of satellite data - Visual interpretation of satellite data using any GIS software. - Digital image processing and classification to generate land use/ land cover- supervised and unsupervised digital image classification and derivation of statistics of classified data.	20
3.	Introductory idea on DGPS– working principles and application, campus / field survey along with the location of important features using DGPS	8
4.	Designing a Digital Elevation Model (DEM) for a very small watershed in the hilly terrain using topographical map/ SRTM data, its 3-D visualization.	6
5.	Geo-processing of data: (a) point buffering and the points and their attributes within various range of buffer distances (b) line buffering and the points and their attributes within various range of buffer distances.	4
6.	Determination of scale, relief displacements, use of stereo-pair for mapping attributes.	4

Reading List:

- Burrough, P. A., 1986: *Principles of Geographical Information Systems in Land Resources Assessment*, Clarendon Press, Oxford.
- Burrough, P.A. and McDonnel, R. A., 1998: *Principles of Geographical Information Systems*, Oxford University Press.
- Curran, Paul, J., 1985: *Principles of Remote Sensing*, Longman Group Ltd.
- Curtis, H., 2000: *The GPS Accuracy Improvement Initiative*, GPS World, June, 2000.
- De Mars, M. N., 1999: *Fundamentals of Geographic Information Systems*, John Wiley & Sons Inc., New York.
- Gonzalez, R. C., Woods, R. E., 2000: *Digital Image Processing*, Fifth Indian Reprint, Addison Wesley Longman, Delhi.
- Gopi, S., 2005: *Global Positioning System Principles and Applications*, Ta McGraw Hill, New Delhi.
- Jensen, J. R., 2011: *Remote Sensing of the Environment – An Earth Resource Perspective*, 3rd Impression, Chapter-14, Pearson, New Delhi.
- Langley, R. B., 1991: *The GPS Receiver – An Introduction*, GPS World, 2(1).
- Maguire, D. J., Goodchild, M. and Rhind, D. J., 1990: *Geographical Information Systems: Principles and Applications*, Longman Science and Technology Publications.
- Sabins, Floyd F., 1987: *Remote Sensing Principles and Interpretation*, W.H. Freeman and Company, New York.
- Colwell, R. N., 1983: *Manual of Remote Sensing*, Vol. I & II, American Society of Photogrammetry.
- Gautam, N. C., 1970: *Urban Land use Study through Aerial Photointerpretation Techniques*, Pink Publishing House, Mathura.
- Lillesand, T. M. and Kiefer, R. W., 1987: *Remote Sensing and Image Interpretation*, John Wiley.
- Star, J. and Ester, J., 1990: *Geographic Information System*, Prentice-Hall.
- Hord, R. Michael., 1986: *Remote Sensing: Methods and Applications*, John Wiley.
- Robinson, A. H., et al., 1995: *Elements of Cartography*, John Wiley.

Course Code: GPH 806SEC

Course Title: Fundamentals of Geographical Information System

Total Credits: (L+T+P= 1+0+1)

This paper, Fundamental of GIS aims to convey the students with the basic idea and concepts of Geographic Information System (GIS). The lessons will try introducing the students the definition and have knowledge about the components of GIS. It is designed to introduce the students the various data types and the data sources for spatial analysis. The practical component of the course will be beneficial for the students in term of hands-on experience about the handling of such data using different software packages. The students will also

learn some very useful skills about digital map making and data processing which will be very helpful for future endeavours.

Following are the learning outcomes-

CO1: Understand Geographic Information System with a clear insight.

CO2: Develop knowledge related to data, data types, structure, and various sources of spatial data.

CO3: Operate software packages related to GIS. Like Arc GIS, Q GIS, Eardas, etc.

CO4: Design digital map making processes.

Unit	Contents	No. of lectures
1.	Geographical Information System (GIS) – definition, components, data types and structure; earth models and referencing systems; data sources.	16
2	PRACTICAL: - Georeferencing an atlas map by using a GIS. -Digitization of administrative boundaries (India/ North-eastern India/ Assam) as polygons and adding socio-economic attributes and preparing thematic maps.	1 credit

Reading List:

- Burrough, P. A.,1986: *Principles of Geographical Information Systems in Land Resources Assessment*, Clarendon Press, Oxford.
- Burrough, P.A. and McDonnel, R. A., 1998: *Principles of Geographical Information Systems*, Oxford University Press.
- De Mars, M. N., 1999: *Fundamentals of Geographic Information Systems*, John Wiley & Sons Inc., New York.

CourseCode: GPH901C

Course Title: Settlement and Urban Geography

Total Credits: 4(L+T+P=3+1+0)

This course discusses evolution of human settlements, determinants of the nature of settlements, and looks at the environmental criteria on location and sustainability of the settlements. Some of the contemporary concerns and developments on land use pattern and outcomes, livability particularly in urban areas are discussed in this course towards having appropriate policy and urban design. Towards thus this course accommodate a few case studies in context of India.

After completion of the course the students will be able to:

CO1: Understand evolution of human settlements.

CO2: Analyze the determinants and dynamics of changes in settlements in third world and India in particular.

CO3: Examine contemporary urban issues and challenges.

CO4: Evaluate policy and programme towards ensuring livability and sustainability of settlements in high population growth context.

Unit	Content	No. of lectures
1	Evolution of human settlements, determinants, settlement types, sustainability and environmental criteria for location of human settlements	6
2	Rural settlement: pattern in old world and new world; changing pattern of rural land use in India, geography of urban settlements: hierarchy of urban settlements, concepts of built-up area, rural –urban fringe, Heat Island, Ecumenopolis, Shanty Towns and Ribbon development.	10
3	Introduction to urban geography, urbanism and urbanization, trend and patterns of urbanization in developed and developing countries.	6
4	Urban location of economic activities- urban morphology and land use, theories related to internal structure of cities: concentric zone theory, sector theory and exploitative model, Indian urban system: growth and organisation-primacy, hierarchy and balance; urban functions and town classification	10
5	Urbanisation in the third world; political economy of urbanisation, contemporary urban issues and challenges: solid waste management, urban crime, environmental pollution, transport and congestion with special reference to developing countries	10
6	Urban design: objectives, scope and techniques, case studies of Chandigarh and Guwahati with reference to land use and urban issues	6

Reading List:

- Ahluwalia, I. J., Kanbur, R., & Mohanty, P. (2014). *Urbanisation in India: Challenges, Opportunities and the Way Forward*. New Delhi: SAGE India.
- Bholey, M. (2016). India's Urban Challenges and Smart Cities: A contemporary Study. *Scholedge International Journal of Business Policy & Governance* , 17-23.
- Davis, M. (2017). *Planet of Slums*. Verso; Reprint edition.
- *Elderly in India -Profile and Programmes.2016* Ministry of Statistics and Programme, Government of India. New Delhi: www. mospi.gov.in.

- Fox, S. (2012). *University of Bristol*. Retrieved from 10.1111/j.1728 4457.2012.00493.x
- Ghosh, S. (1998). *Introduction to Settlement Geography*. Orient BlackSwan.
- Kasarda, J. D., & Crenshaw, E. M. (1991). Third World Urbanization: Dimensions, Theories and Determinants. *Annual Review of Sociology* , 467-501.
- Mandal, R. B. (2001). *Introduction to Rural Settlements*. Bihar (India): Concept Publishing Company.
- Mills, E. S., Becker, C. M., & Verma, S. (1986). *Studies in Indian Urban Development*. World Bank.
- Mukherjee, J. (. (2018). *Sustainable Urbanisation in India Challenges and Opportunities*. Singapore: Springer.
- Mountjoy, A. B. (1978). *Urbanisation in the Third World*. The Geographical magazine
- Rashmi, S. M., Sarkar, D., & Choudhary, A. (2013). *Urban poverty: Issues and Challenges*. Rajesh Publication.
- Siddhartha, K. (2016). *Economic Geography*. Kitab Mahal.
- Siddhartha, K., & Mukherjee, S. (2016). *Cities, Urbanisation & Urban Systems (Settlement Systems)*. Kitab Mahal Publishers and Distributors.
- Singh, R. Y. (2002). *Geography of Settlements*. Rawat Publications.

Course Code: GPH902C

Course Title: Geography of Development and Economic Activity

Total Credit: 4 (L+T+P=3+1+0)

This course discusses the concepts and established theories of development comprehensively to understand location, pattern, and growth of economic activities, understand the measures of development and brings in technology factor to discuss development process. The role of different sources of energy and the transition is critically discussed and appreciated in this course.

Specific learning outcome of the course are –

CO1: Understand the concept and theories of development and location and growth of economic activities.

CO2: Analyse policy and institutional approaches in development

CO3: Classify agricultural patterns in developed and developing countries.

CO4: Apply established theories of development.

Unit	Content	No. of lectures
1	Concept of development and its dynamics, patterns and problems of development, measuring development, the relation between technology and development, technology and economic development - global perspectives.	10
2	Theories of development: Myrdal and Rostow	5
3	Conceptual and theoretical development of economic geography; approaches in economic geography: institutional approach and problem solving approach.	8
4	Economic geography of agriculture: place of agriculture in global economy,	

	critical study of large-scale and small-scale agriculture, regional pattern of agriculture of the U.S.A. and India.	8
5	Theories of industrial location: Weber and Losch and their applicability in selected industries.	7
6	Economic geography of energy: global pattern of energy production from conventional sources: water, coal and petroleum, and nonconventional sources: solar and nuclear.	6
7	Special Economic Zones (SEZ) and technology parks	4

Reading list

- Alexander, J. W., 1986: *Economic geography*, Prentice Hall Inc.
- Bhalla, G. S. and Tyagi, D. S., 1989: *Indian Agricultural Development*, I.S.I.D., New Delhi.
- Choudhury, M. R., 1970: *Indian Industries: Development and Location*, Oxford & IBH, Calcutta
- Das, M. M., 1984: *Peasant Agriculture in Assam*, Inter India Publications, New Delhi.
- Forbes, D. K., 1984: *Geography of Under Development*, John Hopkins Univ. Press, Baltimore.
- Gunner Alexanderson, 1988: *Geography of Manufacturing*, Prentice-Hall Inc, (E.E. Edition)
- Losch, A., 1954: *The Economics of Location*, New Haven.
- Miller, E. W., 1977: *Manufacturing: A Study of Industrial Location*, Pennsylvania State University Press, Pennsylvania.
- Smith, David M., 1981: *Industrial Location: An Economic Geographical Analysis*, Wiley, New York
- Symons, L., 1979: *Agricultural Geography*, West view Press, Colorado
- Thomas, R. S. and Corbin, P. B., 1974: *The Geography of Economic Activity*, McGraw Hill, New York
- Wheeler, J. O. and Muller, P. O., 1981: *Economic Geography*, John Wiley & Sons, New York
- Isard, W., 1975: *Introduction to Regional Sciences*, Engle Wood Cliffs
- Mohammad, N. (ed), 1992: *New Destinations in Agricultural Geography*, Concept Publishing Co., New Delhi.
- Pryde, P. R., 1983: *Non -Conventional Energy Resources*, Wiley, New York.
- Rostow, W. W., 1960: *The Stages of Economic Growth*, Cambridge University Press, New York.
- Roy. and Mukherjee, S. 1993 (2nd Edition): *Economic Geography*, Central Education Enterprises, Calcutta.
- Sushkin, Yulian, G., 1980: *Economic Geography: Theory and Models*, Progress Publishers, Moscow.
- Tarrant, J. R., 1980: *Agricultural Geography: Problems in Modern Geography*, Wiley,

Course Code: GPH903C
Course Title: Research Methodology
Total Credits: 4 (L+T+P=3+0+1)

This course is designed to provide a precise, but comprehensive knowledge on approaches to do research or go for detailed study on areas of student's interest. This course focuses on contextualisation of a research problem to design the research, derive the results and outcomes in a publishable front following the route of research ethics.

Learning Outcomes of the course are

CO1: Identify research concerns, contextualise research problems and locate appropriate methods for study.

CO2: Develop skills to collect data from field using conventional as well as the most advanced tools and techniques.

CO3: Analyse research articles critically

CO4: Demonstrate skills for quantitative analysis in computer.

CO5: Develop a flair on academic writing.

Unit	Contents	No. of lectures
1	Definition of research, essential features of research; nature of geographic research, Introduction to research methodology in geography, formulation of a research problem	6
2	Research design: Meaning, need and features of a research design, statement of the problem, objectives, and hypothesis/ research questions, methodology, significance, review of research works, referencing and bibliography	8
3	Inductive and deductive approaches in geographic research, concept development, model building and hypothesis testing.	8
4	Questionnaire design, construction of indicators / variables, data processing and analysis	10
5	Sources of geographic data: conventional, remote sensing, GIS, GPS.	10
6	Research ethics: plagiarism; data interpretation and research write-up: structure, components and presentation	6
7	Practical: Prepare a literature review on a topic of geographic significance; preparation of questionnaire for survey on a specific problem; Use of MS Excel/SPSS for data processing; hypothesis testing (t test, f test and chi square test)	1 credit

Reading List:

- Ackoff, R. L., 1961: *The Design of Social Research*, University of Chicago Press, Chicago.
- Goode William, J. and Hatt, Paul K., 1952: *Methods in Social Research*, McGrawHill Company, Inc., New York.
- Guthrie Gerard 2010: *Basic Research Methods*, SAGE publications, New Delhi.
- Kothari, C. R., 1993: *Research Methodology: Methods and Techniques*, 2nd ed., Wiley Eastern Ltd., New Delhi.
- Mishra, R. P., 1989: *Research Methodology: A Handbook*, Concept Publishing Company, New Delhi.

- Misra, H. N. and Singh, V. P., 1998: *Research Methodology in Geography*, Concept Publishing Company, New Delhi.
- Montello, Daniel R. and Paul C. Sutton, 2006: *An Introduction to Scientific Research Methods in Geography*, Sage Publications, London.
- Nalwa, V., 1992: *The A B C of Research for Behavioural and Social Sciences*, Wiley Eastern, New Delhi.
- Prasad, H., 1992: *Research Methods and Techniques in Geography*, Rawat Publications, Jaipur

Course Code: GPH 904 SP 1

Course Title: Drainage Basin and Hydrology

Total Credits: 5 (L+T+P= 2+1+2)

This course introduces the basic concepts of fluvial geomorphology of drainage basin and their hydrological properties; would help the students to have better understanding on the nature of influence inserted by the underlying geo-environmental features, land and water resources development with basin management at local and regional level.

Learning outcome of the course are

CO1: Understand the basic concept and processes of drainage basin and their hydrological aspects.

CO2: Analyse the human interference on natural landscape through developmental work on river basin.

CO3: Apply watershed level maps and models based on satellite and conventional data using Statistical and Geospatial techniques.

CO4: Design maps for the integrated river basin planning and management.

Unit	Content	No. of lectures
1	Field and scope of fluvial geomorphology; recent advancements; relation between fluvial geomorphology and hydrology; concepts on river / drainage basin and health of the rivers, basic considerations on delineation of river basin; major fluvial regimes of India.	5
2	Drainage basin characteristics - shape, size, topographic, rock and soil, and vegetation; association between one to other basin characteristics; human interference in the basin: dam construction and resultant affects.	5
3	Drainage basin as a morphometric unit; drainage basin morphometry - linear, areal and relief aspects of the basin and associated laws of drainage morphometry; hypsometric analysis of the basin.	6
4	Drainage basin as a fluvial system: hydrological cycle, input, and output of the basin; runoff, components of runoff, factors affecting runoff, runoff estimation and urban flooding.	6
5	Basic hydrological processes: precipitation, evapotranspiration, infiltration, interception; ground water - occurrence, types, and movement; quality and quantity measures, principles of water balance and its application, with special reference to crop productivity.	5
6	River basin planning and development- basic principles and practices; integrated drainage basin management, modern methods and techniques in fluvial geomorphological studies: Remote Sensing, GIS and computer application.	5

7	Practical- - Preparation of a DEM of hill / mountainous area from contours and computation of slopes and aspects. 3-D visualization of SRTM Data. -(i) Verification of the laws of drainage network analysis-(a) drainage order and numbers, (b) order and length (c) order and area (ii) drainage density and (iii) drainage frequency map, (iv) basin circularity ratio and form factor, (v) hypsometric curve. -(i) Delineation of a well-defined drainage basin, computation of area; (ii) drawing of drainage network and computation of basin length, river length and shape index.	2 credit
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Reading List:

- Chorley, R. J. (ed), 1969: *Water, Earth and Man*, Methuen, London.
- Gregory, K. J. and Walling, D. E., 1973: *Drainage basin Form and Processes*, Arnold, London.
- Jensen, J. R., 2011: *Remote Sensing of the Environment – An Earth Resource Perspective*, 3rd Impression, **Chapter-14**, Pearson, New Delhi.
- Goudie, Andrew, et. Al. (eds), 1981: *Geomorphological Techniques*, George Allen & Unwin, London.
- King, C. A. M., 1966: *Techniques in Geomorphology*, Edward Arnold, London.
- Knighton, D., 1984: *Fluvial Forms and Processes*, Edward Arnold, London.
- Leopold, L. B., Wolman, M. G., and Miller, J. P., 1964: *Fluvial Processes in Geomorphology*, W.H. Freeman, USA.
- Morisawa, M., 1968: *Streams: Their Dynamics and Morphology*, McGraw Hill Book Company, New York.
- Sabins, Floyd. F., 1978: *Remote Sensing: Principles and Interpretation*, H. W. Freeman and Company, San Francisco.
- Smith, D. I. and Stopp, P., 1978: *The River Basin: An Introduction to the Study of Hydrology*, Cambridge.
- Chow, V. T., 1964: *Handbook of Applied Hydrology*, McGraw Hill Book
- Fairbridge, R. W. (ed), 1968: *Encyclopedia of Geomorphology*, Reinhold, New York.
- Mutreja, K. N., 1986: *Applied Hydrology*, McGraw Hill Book Company, New York.
- Charlton R (2015) *Fundamentals of Fluvial Geomorphology*, Routledge, New York.
- Brierley G.J. and Fryirs K.A. (2005) *Geomorphology and River Management*, Blackwell Publishers, USA, UK, Australia

CourseCode: GPH 904 SP2

CourseTitle: Remote Sensing Principles and Techniques

Total Credits: 5, (L+T+P, 2+1+2)

This course is offered to the students' opting specialization in Geoinformatics. This course has both theory and practical components; will help the students to get a comprehensive idea of different tools and techniques of remote sensing in specific. Both the theoretical ideas and practical knowledge can be enhanced through this course. The course areal image interpretation and analysis, introduction to various satellite missions and data availability from those satellites. The course also includes the basic idea of electromagnetic radiation, which is backbone of digital image data analysis and interpretation in remote sensing. This course in addition includes various types of remote sensing such as thermal, hyper spectral, microwave and LiDAR Remote Sensing. In practical portion the hands on experience of

determination of scale and displacements of aerial photographs, stereoscopic interpretation of aerial photos, characteristics and statistics, computation areas on image, LU/LC mapping, identification of geomorphological features, digital image processing such as unsupervised, supervised classification and reporting of statistics.

Following are the learning outcomes-

CO1: Understand the domain of Geoinformatics.

CO2: Locate digital data on various satellite missions of different countries.

CO3: Develop hands-on skills to handle digital data and convert data into useful information.

CO 4: Develop mapping skills, especially land use mapping.

Unit	Content	No. of lectures
1	Aerial photography – needs and applications, geometry of vertical air photographs – scale and height measurements, stereoscopic measurements of object height, digital orthoimages and their uses.	6
2	Aerial camera and film characteristics, planning aerial photography missions, elements of visual image / photo interpretation.	6
3	Earth observation satellites and remote sensing satellites; types and characteristics of sensors, remote sensing data products and characteristics – spatial, radiometric, spectral and temporal resolutions with reference to IRS, SPOT, Quickbird, GeoEye and LANDSAT data; Path – Row referencing system	6
4	Electromagnetic radiation principles, responses of earth materials – water, vegetation, urban landscape, soils and minerals; remote sensing of natural resource monitoring and management	8
5	Principles of thermal, hyper spectral, microwave and LiDAR Remote Sensing.	6
6	Practical: Determination of scale and displacements of aerial photographs (ii) stereoscopic interpretation of aerial photos; Any two exercises on image characteristics and statistics, computation areas on image. LU/LC Mapping Identification of geomorphological features. DIP- unsupervised, supervised classification and reporting of statistics.	2 credits

Reading list:

- Agarwal, C. S., and Garg, P. K., 2000: *Textbook on Remote Sensing in Natural Resources Monitoring and Management*, Wheeler Publishing, New Delhi.
- Anderson, J. R., et al., 1976: *A Land use / Landcover Classification System for Uses with Remote Sensing Data*, USGS Professional Paper.
- Avery, T.E., 1963: *Interpretation of Aerial Photography*, Burgess Publishing Co., Minneapolis.
- Gonzalez, R. C., Woods, R. E., 2000: *Digital Image Processing*, Fifth Indian Reprint, Addison Wesley Longman, Delhi.
- Jensen, J. R., 2011: *Remote Sensing of the Environment – An Earth Resource Perspective*, 3rd Impression, Pearson, New Delhi.
- Lillesand, T.M. and Kiefer, R.W., 1987: *Remote Sensing and Image Interpretation*, John Wiley.
- Wolf, R., 1974: *Elements of Photogrammetry*, McGraw Hill, New York.

Course Code: GPH 904 SP3

Course Title: Basis of Regional Planning and Development

Total Credits: 5, (L+T+P, 2+1+2)

The course comprehensively places the arguments on the need of regional planning towards achieving balanced development outcomes in a country. The students shall get introduced to the established theories of development/underdevelopment and to place critical view on the approaches of the state towards achieving the desired goals through some case studies in context of India.

The students shall learn the approaches of regionalization, empirically, based on secondary data of the state surveillance systems in India; and do the analysis in statistical software using established methods. In addition, certain statistical measures shall be taught to measure disparity and level of development, use secondary data, towards addressing specific study problems having policy relevance.

The specific learning outcome of this course will be –

CO1: Understand the development theories propagated since the last century and critically assess their relevance in contemporary contexts.

CO2: Design approaches to study development intervention through certain cases.

CO3: Analyse development data sets collected by the surveillance systems of India.

CO4: Apply statistical methods to have measures on different facets of development.

Unit	Content	No. of lectures
1	Need and purpose of regional planning: synoptic, functional and adhoc or specific	4
2	The concept of region, regionalization and regional development	4
3	Central place Theory of Christaller, Growth Pole Theory of Perroux and Boudeville, Theory of Prebisch, Cumulative Causation Theory of Gunnar Myrdal and Multi-level Growth Foci concept of R. P. Mishra	8
4	Case studies of regional planning exercises: National Capital Region and North East India, River basin planning- a case study from India	6
5	Decentralization and multi-level planning - features of decentralised planning, decentralised planning in India, concept and procedures in multilevel planning; stages in the evolution of multi-level planning process, multi-level planning in India, regional planning strategy under five-year plans	10
	Practical: - Regionalisation using methods – (i) overlapping of different themes, (ii) combinational analysis- Weaver's method and Nelson's method and (ii) Factor analysis - Demarcation of nodal region. - Disparity in concentration of different groups of population by (i) L. Q. Method; (ii) Lorenz Curve. - Functional classification of regions	2 credit

Reading list:

- Alden J. and R. Morgan, 1974: ***Regional Planning: A Comprehensive View***, Leonard Hills Books, U.K.
- Bhat, L. S., 1976: ***Micro-Level Planning: A Case Study of Karnal Area, Haryana***, Concept Publishing Co., New Delhi.
- Chand, M. and Puri, V. K. 1993: ***Regional Planning in India***, Allied Publishers Limited, B/M Asraf, Ali Road, New Delhi-110002.
- Chandna, R. C., 2000: ***Regional Planning: A Comprehensive Text***, Kalyani Publishers, New Delhi.
- Dickinson, R. E: City, ***Region and Regionalism***,
- Hall, P., 1975: ***Urban and Regional Planning***, David and Charlos, London.
- Hilborst, J. G. M. (1971) : ***Regional Planning: A System Approach***, Notterdam University Press.
- Mishra, R. P, 1992: ***Regional Planning: Concept, Techniques, Policies and Case Studies***, Concept Publications, New Delhi.

Course Code: GPH 904 SP 4

Course Title: Basic foundation of Cartography

Total Credit: 5 (L+T+P= 2+1+2)

The objective of the course is to develop an understanding of the history of cartographic development, recent trends and impact on changing technologies on the subject. The course covers basic Geodesy, the use of different theoretical shapes of the earth and geodetic position determination and measurements. The course also covers the fundamentals of spherical trigonometry and principles of geodetic surveying. The course is designed to enable the students to choose map projection according to the purpose of map-making. The objective of the course is also to offer practical knowledge to the students on handling modern survey instruments like total station and DGPS.

On completion of the course, the students shall be able to,

CO1: Develop an understanding of the concepts regarding spherical, ellipsoidal, and geoidal earth and their use.

CO2: Apply the concepts of spherical trigonometry, coordinate system and map projections to suit map purposes.

CO3: Create topographic maps through the application of modern geodetic survey instruments.

CO4: Explain and communicate fundamentals concepts of cartography, map generalization and map design.

CO5: Create professional and aesthetically pleasing thematic maps through thoughtful application of Cartographic conventions.

Unit	Contents	No. of lectures
1	Defining the field of cartography; history of development and recent trends, cartography today and tomorrow- impact of changing technology and information age mapping.	4
2	Basic Geodesy – cartographic use of spherical, ellipsoidal and geoidal earth, geographical coordinates; properties of the graticules – distance on the sphere and great circle, direction and area; geodetic position determination – geodetic latitude and longitude, horizontal control and vertical control network.	7
3	Fundamentals of spherical trigonometry: Spherical triangle, spherical excess, sine and cosine formulae, Napier’s rule of five part circle, convergence of meridians.	5
4	Principles of ground survey and positioning; geodetic and plane surveying; concept of triangulation survey, automated survey systems- total stations, electronic positioning, basic concept and principles of surveying by Global Positioning Systems (GPS).	5
5	Basic problems of map projection (earth’s shape and size, scale and coordinate system) and principles and methods of construction: zenithal oblique gnomonic and stereographic projections	7
6	Methods of thematic map reproduction, problems, prospects and emerging issues in thematic cartography.	4

7	PRACTICAL: Albers conical equal area projection and gauss' conformal projection homolosine projection, international projection. Surveying by total station/ GPS/DGPS, theodolite Two qualitative and two quantitative thematic map of (Assam /India / North East India).	2 credit
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Reading list:

- Clendinning, J., 1960: *Principles of Surveying* 2nd edition.
- Curtis, H., 2000: *The GPS Accuracy Improvement Initiative*, *GPS World*, June 2000.
- Deetz, C. H. and Adams, O. G.: *Elements of Map Projections*, Govt. Printing Office, Washington.
- Garnett, W.: *Map Projections*, George Phillip and Sons, London.
- Gopi, S., 2005: *Global Positioning System Principles and Applications*, Ta McGraw Hill, New Delhi.
- Hinks. A. R., 1921: *Map Projections*, Cambridge University Press, London.
- Kanetkar, T. P. And Kulkarni, S. V., 1972: *Surveying and Levelling* [Part-I &II], VidyarthiGrihaPrakashan, Pune.
- Langley, R. B., 1991: *The GPS Receiver – An Introduction*, *GPS World*, 2(1).
- Robinson, A. H.; Morrison, J. L.; Muehrcke, P. C.; Kimerling, A. J. And Guptill, S. C., 1995: *Elements of Cartography*, John Wiley & Sons Inc, New York.
- Sandover, J. A., 1961: *Plane Surveying*, Arnold.
- Steers, J. A., 1953: *An Introduction to the Study of Map Projections*, University of London Press, London

Course Code: GPH 904 SP 5

Course Title: Agricultural Geography

Total Credits: 5 (L+T+P, 2+1+2)

The course discusses in detail the approaches to study agriculture geography, and factors those are considered critical in development of the sector. Learning on the concepts of measurement would help to capture the trend in development of the sector on intensity, diversification and efficiency to the ecology and environmental factors and agricultural regionalization for effective land use planning.

Learning outcome:

- CO1: Understand the conceptual frameworks and approaches to study agriculture,
- CO2: Analyse the relationship between the environment and primary activities.
- CO3: Examine the significance and relevance of theories in relation to the location of primary activities.
- CO4: Apply certain techniques and methods in agricultural research.

Unit	Content	No. of lectures
1	Approaches to the study of agricultural geography: commodity, systematic, regional, inductive, and deductive, modern trends in the study of agricultural geography.	6
2	Determinants of agriculture: physical, economic, social, institutional, and technological; land holding and land tenure systems; land reforms, land use policy and planning.	6
3	Selected agricultural concepts and their measurements: cropping pattern, crop rotation, crop concentration, intensity of cropping, diversification, efficiency and productivity, crop combination regions	6
4	Methods in agricultural geography: Von Thunen's model of agricultural location and its recent modification; concept of agricultural region, agricultural types and agricultural systems.	8
5	Agricultural classification according to Whittlesey, land use and land capability classification.	6
6	Practical: -Origin and diffusion of agriculture in the world -Preparation of agricultural land use map -Crop combination- Nelson's method and Weaver's method, Crop concentration. -cropping intensity map. -Measurement of agricultural productivity: (a) Kendall's ranking co-efficient method; (b) Sapre and Deshpande's method of weighted index; (c) Jasbir Singh's method and (d) Bhatia's method.	2 credit

Reading List:

- Alexander, J.W., 1963: *Economic Geography*, Prentice Hall, Englewood Cliffs, N. J.
- Anderson, J.R., 1970: *A Geography of Agriculture*, Iowa: WMC Brown Co.
- Clark, Colin and Haswell, Margaret, 1964: *The Economy of Subsistence Agriculture*, St. Martin's, London.
- Chorley, R. J. and Haggett, P., 1971: *Socio-Economic Models in Geography*, Methuen and Co. Ltd., London.
- Hussain, M., 2001: *Systematic Agricultural Geography*, Rawat Publication, Jaipur and New Delhi.
- Morgan, W.B. and Munton, R.J.C., 1971: *Agricultural Geography*, Methuen, London.
- Singh, J., 1974: *Agricultural Atlas of India: A Geographical Analysis*, Vishal Publishers, Kurukhsetra.
- Singh, J., 1976: *Agricultural Geography*, Tata McGraw Hill Pub. Co., New Delhi.
- Symons, L., 1967: *Agricultural Geography*, G. Bells and Sons, London.
- Tarrant, John, R., 1974: *Agricultural Geography*, David and Charles, Newton Book House, Delhi.
- Tiwari, 1991: *Agricultural Geography*, International Book House, Delhi.
- Whittlesey, D., 1936: 'Major Agricultural Regions of the World', *Annals of the Association of American Geographers*, 26.
- Gregor, Howard, F., 1970: *Geography of Agriculture: Themes in Research*, Prentice Hall, Englewood Cliffs, N. J.
- Grigg, D.B., 1978: *Agricultural Systems of the World: An Evolutionary Approach*, Cambridge University Press, Cambridge.

- Ilbery, 1991: *Agricultural Geography: Social and Economic Analysis*, International Book House, Delhi.
- Mohammad, N. (ed), 1992: *New Dimensions in Agricultural Geography* (in 8 Volumes), Concept Publishing Company, New Delhi.
- Wheeler, K. B., Ladley, A. M. and Leong, F. G., 1970: *Studies in Agricultural Geography*, Bland Educational, London.

Course Code: GPH 904 SP 6

Course Title: Conceptual and Theoretical Framework of Social Geography

Total Credits: 5, (L+T+P, 2+1+2)

The course introduces the students to the domain, concepts, and approaches to study social geography. The processes of social change and development, considering the perspective of Gender, and approaches to reduce the gender gaps are important components of the paper. Students shall learn to measure socio-spatial relationships, disparity, and social area mapping by using principal component analysis.

CO1: Understand structural aspects of the society.

CO2: Demonstrate the current knowledge on the philosophical and methodological approaches.

CO3: Apply statistical tools to measure development outcomes in social spaces.

CO4: Examine the concept of gender and gender gaps in social and public life

Unit	Contents	No. of lectures
1	The nature and development of social geography, approaches of study, philosophical and methodological development, and contemporary trends in social geography; development of social geography in India.	6
2	Concepts of social space, social organization, social area analysis and factorial ecology, understanding society and its structure and process, geographical bases of social formations.	4
3	Social groups, social structure, and social development: an international perspective, processes of social change: modernization, urbanization, industrialization and other socio-economic and cultural processes.	8
4	Gender perspective in Social Geography: Status and role of women in a society, gender discrimination, participation in politics and enfranchisement.	8
5	Gender gaps in social and public life: education, wage differentials in economic activities, health care and nutrition; scope for bridging gender gap: empowerment of women with education and economic opportunities.	6
6	Practical: Social area analysis by Principal Component Analysis (PCA), Distribution and concentration pattern among social groups. Socio-spatial relationships, disparity and gradient patterns.	2 credit

Reading list:

- Ahmad, A., 1999: *Social Geography*, Rawat Publications, Jaipur and New Delhi.
- Ahmad, A., (ed), 1993: *Social Structure and Regional Development: A Social Geography Perspective*, Rawat Publications, Jaipur.
- Eyles J: 'Social Geography', in Johnston, R.J., et al, *The Dictionary of Human Geography*.
- Jones, E. and Eyles, J., 1977: *An Introduction to Social Geography*, Oxford University Press, Oxford, and New York.
- Hannett, Caris. (eds), 1996: *Social Geography: A Reader*, Arnold, London.
- Jones, E, (ed), 1975: *Readings in Social Geography*, Oxford University Press, Oxford. London.
- Milton, Keynes, 1972: *Social Geography: New Trends in Geography*, Open University Press.
- Taher, M., 1994: *Social Geography: Concept and Theories*, NEIGS, Guwahati.
- Carter, John and Trevor, Jones., 1989: *Social Geography: An Introduction to Contemporary Issues*, Edward Arnold, London.
- Gregory, D. and Urry, J. (eds), 1985: *Social Relation and Social Structure*, Macmillan, London.
- Harvey, D., 1972: *Social Justice and the City*, Arnold, London.
- Jackson, P. and Smith, S., 1984: *Exploring Social Geography*, George Allen and Unwin (Publishers) Ltd., London
- Knox P, 1995: *Social Well-being: A Spatial Perspective*, Oxford University Press Oxford.
- Momsen, J. H. and Townsend, G., 1987: *Geography of Gender in the Third World*, Hutchinson, State University of New York Press, London, New York.
- Sharma, H. N., 2000: 'Social Geography' in Singh, J.(ed.) *Progress in Indian Geography (1996-2000)*, INSA, New Delhi.
- Smith, D. M., 1977: *Human Geography: A Welfare Approach*, Edward Arnold,

Course Code: GPH 905 OE

Title: Geography of Environment and Sustainability

Credits = 4 (Lectures 3 and Tutorials -1)

This course is to be taken up by postgraduate students from any discipline of social and natural sciences. The broad objectives of the course are to make the students acquainted with the concepts of environment and sustainability. The course focuses on the understanding impacts of human interventions on the environment and resulting changes to the global climate, occurrence of disaster and hazards. The course emphasises mapping the monitoring and evaluation mechanism to have a policy and regulatory interventions at the international and national levels. The course also covers environmental concerns on climate conflict and managing the common pool of resources.

On completion of the course, the students shall be able to,

CO1: Understand the impact of global climate change and the responses to the change at the national, regional, and local levels.

CO2: Examine, assess, and debate the major schools of thought and theories on resources economics, sustainable development, and management of common pool of resources.

CO3: Evaluate and critically examine the nature and backgrounds of environmental conflicts in India.

CO4: Discuss in detail market-based and regulatory instruments in environmental management, environmental acts, laws and policies and environmental impact assessment.

CO5: Evaluate the politics of global climate change.

CO6: Apply geospatial technologies in natural resource management.

Units	Contents	Lectures
1	Concepts: Biogeochemical cycles; trophic level decompositions; terrestrial ecosystem- forests, grassland, desert, and agriculture; ecosystem services, biodiversity conservations	6
2	Global Climate Change and its impact- agriculture and resource based sectors. Global warming and outcomes; Response to climate change at national and regional and local level; Politics of global climate change	6
3	Natural Resource Economics: Consumption, production and exhaustibility, the limits to growth, justifying a conservationist strategy, sustainability, and challenges; sustainability and individual rationality	6
4	Environmental Degradation and Hazards: Anthropogenic interventions in economic sectors (cropping pattern changes and input intensity, mining, industrialisation, and infrastructure developments) and the environment; water, air and noise pollution, land degradation, generation of solid wastes, floods, and soil erosions; storm water and urban floods, hazards, and valuations	8
5	Environmental conflicts in India; understanding the nature and background; The state of environment of Northeast of India: Changes and challenges	2
6	Tragedy of the Commons; Common Property Resources: Managing the commons – role of the state and society; unregulated and regulated common property, moral economy, cooperatives, and collective actions	8
7	Environmental conservation and management initiatives in India: Environmental protection policy, regulations and Acts; Environmental Impact Analysis, market based and regulatory instruments in environmental management	8
8	Understanding application of GIS and Remote Sensing in natural resource management and sustainable environment	4

Course Code: GPH1001C

Course Title: Contemporary issues in Human Geography

Total Credits: 4, (L+T+P, 3+1+0)

This course at a higher level discusses theoretical and conceptual developments in human geography towards having a holistic understanding on the society and social processes from geographical perspective. Towards this focus is placed to comprehend and apply the concepts of space and place to apprise different social issues, actions, and movements at regional and global level.

After going through the course, the students will have ability to

- CO1: Understand basic concepts of human, social and political geography.
- CO2: Relate geographic concepts to social issues.
- CO3: Analyse contemporary socio-spatial issues considering of different socio-political and economic processes.
- CO4: Weight the concepts and issues from local/regional context

Unit	Content	No. of lectures
1	Human geography: changing nature, issues and debates; social theory in human geography.	8
2	Conceptualizing space and place: structure and dynamics of space; relational framework of space and place; sense of place.	8
3	Geography of difference and exclusion: geographies of identity and difference related to class, religion, caste, gender and location.	10
4	Social justice and political geography of difference.	4
5	Geography of social action and movements: reasons and approaches to social movements; aspects of social security; social-environmental movements in india.	10
6	Social and ethnic diversity in Northeast India – Social groups, tribes, religion and social tensions.	8

Reading List:

- Agnew, J. A. and Corbridge, S., 1995: *Mastering Space: Hegemony, Territory and International Political Economy*, Routledge, London.
- Benko, G. and Strohmayr, U., 1997: *Space and Social Theory: Interpreting Modernity and Postmodernity*, Blackwell Publishers, Oxford, London.
- Bhabha, H., 1994: *The Location of Culture*, Routledge, London and New York.
- Cloke, P, et al, 2005: *Introducing Human Geographies*, Hodder Arnold, UK
- Dear, M.J and Flusty, S, 2002: *The Spaces of Postmodernity, Readings in Human Geography*, Blackwell Publishers, Great Britain.
- Derek, G., Martin, R., and Smith, G., 1994: *Human Geography: Society, Space and Social Science*, Macmillan Publishers, Cambridge.
- Dikshit, R.D, 1997: *Geographical Thought: A Contextual History of Ideas*, Prentice Hall India Learning Pvt. Ltd
- Harvey, D., 1996: *Justice, Nature and Geography of Difference*, Blackwell Publishers, Cambridge.
- Johnston, R. J., 1991: *A Question of Place: Exploring the Practice of Human Geography*, Blackwell Publishers, Cambridge.
- Massey, D., 1998: *Space, Place and Gender*, Polity Press, Cambridge.
- Massey, D., Allen, J., and Sarre, P., 1999: *Human Geography Today*, Blackwell Publishers, Cambridge.
- Redcliff, M., and Benton, T., 1994: *Social Theory and Global Environment*, Routledge, London and New York.
- Sibley, D., 1995: *Geographies of Exclusion: Society, and Difference in the West*, Routledge, London.

Course Code: GPH1002 SP 1
Course Title: Channel Form and Processes
Total Credits: 5(L+T+P=2+1+2)

This course includes all the concepts of fluvial geomorphology, and how the knowledge of fluvial environment helps in decision making process to sustain development process on this earth. In the process this course studies and understand the dynamic fluvial landforms, including the hazards and disasters, caused by natural as well as anthropogenic factors and the outcomes.

The specific learning outcomes are -

CO1: Understand the basic concept and processes of fluvial Landscape and comprehend the human and river environment relationships.

CO2: Identify critical problem of fluvial environment caused by natural and human economic activities through field-based knowledge.

CO3: Apply case study-based analysis for mitigating the problems in regional/local level.

CO4: Design maps using statistical and geospatial techniques for the sustainable land and water management.

Unit	Content	No. of lectures
1	River channel processes-forces acting in channel, velocity distribution, types of flow and their characteristics; erosion, deposition, and transportation of sediment in channel, grain size analysis of sediment.	6
2	Channel form - the longitudinal profile, grade, plan geometry, channel pattern-straight, meandering and braided, initiation and development of meandering channels, geometry of meanders, flow in meanders, mechanics and causes of braiding.	6
3	Cross sectional form, hydraulic geometry analysis, variation in hydraulic characteristics at-a-station, and in a downstream direction.	5
4	Fluvial landforms - processes and pattern of development of flood plain, alluvial fan and delta.	5
5	Channel changes in time and over space. Fluvio – geomorphic hazards: flood and bank erosion, sedimentation, landslides, and soil erosion with special reference to Northeast India.	5
6	Effects of man on channel processes - Dam and reservoir construction, channel straightening, bank stabilization, sand, and gravel extraction.	5
7	PRACTICAL: Discharge hydrograph, stage –discharge relationship, frequency analysis of hydrologic event (flood / rainfall) by – (a) plotting position, (b) log-pearson type-iii distribution and gamble’s extreme value distribution. identification and mapping of straight, sinuous, meandering, and braided channels in satellite imagery or aerial photographs / topographical maps, computation of sinuosity index, braiding index and longitudinal profile of river, width versus discharge, depth versus discharge and velocity versus discharge relationships from empirical data, identification and mapping of fluvial landforms in satellite imagery or aerial photographs / topographical maps	2 credit

Reading list:

- Chorley, R. J. (ed), 1969: *Water, Earth and Man*, Methuen, London.
- Garde, R. J. and RangaRaju, K.G.: *Mechanism of Sediment Transportation*.
- Goudie, Andrew, et. Al. (eds), 1981: *Geomorphological Techniques*, George Allen & Unwin
- Gregory, K. J. and Walling, D. E., 1973: *Drainage basin Form and Processes*,
- King. C. A. M., 1966: *Techniques in Geomorphology*, Edward Arnold, London. Unwin, London.
- Leopold, Wolman and Miller, 1964: *Fluvial Processes in Geomorphology*, W. H. Freeman and Company, San Francisco.
- Morisawa, M., 1968: *Streams: Their Dynamics and Morphology*, McGraw Hill Book Company, New York.

CourseCode: GPH1002 SP 2**Course Title: Principles & Application of GIS & GPS****Total Credits: 5 (L+T+P=2+1+2)**

This course is the continuation of specialization course for PG Students. This course has two most important elements of Geoinformatics, Geographic Information System (GIS) and Global Positioning System (GPS) and teaches both the theoretical and practical components. The course emphasizes on enhancing knowledge on the data structure and database management, which are integral part of GIS. Advanced tools of digital image processing and analysis such as different overlay analysis and interpolation are also taught. In addition, this course provides a clear insight of the attribute mapping of both qualitative and quantitative data. Along with GIS, equal importance is paid to GPS. The theoretical part includes the introduction, working principles, satellite position, ranging, time calculation, GPS errors and their corrections, GPS Receivers, and its features, DGPS working principles, accuracy in DGPS, etc. The different techniques of field survey and their theoretical knowledge are also incorporated in the course. In practical portion, attribute mapping, geo-processing, proximity analysis, GPS / DGPS coordinates mapping by using database / text files, Surveying by GPS / DGPS for topographic mapping; etc. are included.

Following are the learning outcomes-

CO1: Locate the advanced knowledge of Geographic information System and Global Positioning System.

CO2: Understand of data structure and data management tools, data is one of the prime components of GIS.

CO3: Use advanced level mapping techniques such as overlay analysis, and interpolation of complex data for easy representation.

CO4: Use GPS and DGPS for precision mapping and attributes of the earth phenomena.

Unit	Content	No. of lectures
1	Geographical Information Sciences – a brief history; Definitions of GIS, Components of a GIS; Data models and their use; Referencing systems and earth models and geodetic aspects.	5
2	Database structure and their organization in computer, Database Management Systems; Spatial data structures – the choice between vector and raster; Data input, verification, storage and output.	6
3	Creating continuous surfaces from point data; Methods for interpolation; Digital elevation models and their uses; Map overlays- arithmetic and weighted overlays.	6
4	Spatial analysis and operations: The basic classes of operations for spatial analysis; Operations on the attributes of geographic entities.	5
5	Introduction to GPS and its working principles – satellite position, ranging, time calculation, GPS errors and their corrections, GPS Receivers and its features, DGPS working principles, Accuracy in DGPS.	4
6	GPS surveying methods – absolute positioning and relative / differential positioning, static surveying and kinematic surveying; Real time kinematic (RTK) surveying; Topographic mapping and GIS applications for GPS / DGPS.	6
7	Practical: -Georeferencing of Raster map / image and Coordinate transformation; (ii) Vector data creation and editing and presentation of thematic outputs -Point attribute mapping by (i) continuous raster grids and (ii) TIN; Line attribute mapping by (iii) continuous raster grids and (iv) TIN -Geoprocessing / Proximity analysis (i) point buffering, (ii) line buffering; (iii) Raster Overlays of two or more layers; (iv) Thematic mapping of polygon attributes (any two) and their raster conversions -GPS / DGPS coordinates mapping by using database / text files Surveying by GPS / DGPS for topographic mapping; (ii) Mapping of location based services / events by GPS/DGPS.	2 credit

Reading list:

- Burrough, P. A., 1986: *Principles of Geographical Information Systems in Land Resources Assessment*, Clarendon Press, Oxford
- Burrough, P. A. and McDonnell, R. A., 1998: *Principles of Geographical Information Systems*, Oxford University Press, Oxford.
- Curtis, H., 2000: *The GPS Accuracy Improvement Initiative*, GPS World, June 2000.
- Chrisman, N., 1997: *Exploring Geographic Information Systems*, John Wiley & Sons Inc.,
- De Mars, M. N., 1999: *Fundamentals of Geographic Information Systems*, John Wiley & Sons Inc., New York.
- Gopi, S., 2005: *Global Positioning System Principles and Applications*, Tata McGraw Hill, New Delhi.
- Kraaak, M. and Ormelling, F., 2004: *Cartography Visualization of Geospatial Data*, Pearson Education, Delhi.

Course Title: GPH1002 SP 3**Course Title: Regional and Global Perspective of Development****Total Credits: 5 (L+T+P=2+1+2)**

The course having applied dimensions shall help the students to get informed with most of the concepts of development, discussed, and debated in the world in contemporary times. The students shall be introduced to construct indicators on various facets of developments and have the measures at different spatial contexts. In the process the students would assess, and critically apply their understanding accumulated from reading the theories of development/underdevelopment, the approaches, and perspectives of selected developed as well as developing countries to address certain specific problem having policy relevance and management in their own study context.

The students on practical component shall use a wide range of secondary data – local, regional, national, and country specific to read and assess development concerns from a holistic perspective using a wide range of statistical techniques.

The specific learning outcome of this course are-

CO1: Understand development policies and locate interventions in selected countries.

CO2: Analyse the state of development critically and variations shaped by the regulatory measures/process in contemporary world.

CO3: Organise secondary data sets and construct indicators on development measures.

Unit	Content	No. of lectures
1	The concept of development, development indicators: per capita income, energy and demographic indicators	6
2	Theories of under development: Marxist, Centre-periphery and Dependency theories, Regional development perspectives in Netherland and Italy, Social dimensions of regional development	8
3	Patterns of world economic development: agricultural, industrial, commercial and technological, Planning for problem areas in India: tribal sub-plan, drought prone areas, Approaches to mapping of Indian economic development: development-index approach, consensus approach, subjective integration approach	8
4	Urban renaissance of 1990s in UK, Urban revitalization in United States: Policies and practices, Africa's political and social development issues	6
5	Sustainable development: objectives, strategies and possibilities, Development and globalisation	4
6	Practical: - Regionalisation using methods of: (a) Overlapping of different themes (b) Ranking using mean and standard deviation. - Use of disparity index - mapping development of Indian states using HDI measures - Distribution of economic activities and settlements. - Network analysis: Application of aggregate connectivity for regional Development using (a) alpha, beta, gamma and cyclomatic number and (b) Use of Accessibility and Detour Index	2 credit

Reading List:

- Barua, P. C., 1990: *Development Planning of North East India*, Mittal Publications, New Delhi.
- Boaduo, N. A.-P. (2008). *Africa's Political, Industrial and Economic Development Dilemma in the Contemporary Era of the African Union. The Journal of Pan African Studies* , 93-106.
- Chand, M. and Puri, V. K. 1993: *Regional Planning in India*, Allied Publishers Limited, B/M Asraf, Ali Road, New Delhi-110002.
- Chandna, R. C., 2000: *Regional Planning: A Comprehensive Text*, Kalyani Publishers, New Delhi.
- Friedman, J. and William Alonso (eds), 1964: *Regional Development and Planning*, Cambridge, Mass. M.I.T. Press.
- Friedman, J., 1973: *Utilization, Planning and National Development*, Bererly Hills, Sage Publications.
- Kidwai, A. H., 1985: *Disparities in the Levels of Regional Development and Spatial Differentiation in India in the Historic Context*, CSRD, JNU, Mimeo.
- Lawal, G. (2006). *Global and Development: The Implications for the African Economy*. *Humanity & Social Science Journal* , 65-78.
- Macinonis, and Parrillo, 2010: *Cities and Urban Life*, PHI Learning Pvt. Ltd., New Delhi.
- Mishra, R.P., 1992: *Regional Planning Concepts*, Techniques, Policies and Case Studies, New Delhi. Concept Publishing Company
- Mukherjee, A., 1993: *A Perspective Plan for a Hill District, Heritage*, New Delhi.
- Sandesara, J. C., 1992: *Industrial Policy and Planning*, 1947-91: Tendencies, Interpretations and Issues, Sage Publications, New Delhi.
- Sivaramakrishnan, K. C., et al., 2005: *Handbook of Urbanization in India – an Analysis of Trends and Processes*, OUP, New Delhi.
- Snallenbrock, A. J. H. and Spit, T. J. M., 1992: *Regions and Regionalization in the Netherlands*, *Tijdschrift Voor, Econ. En. Soc. Geografie*. 82 (3).
- Sutton, D. S. (2008). *Urban Revitalization in the United States: Policies and Practices, Final Report*. Seoul National University: USURRP.

Course Code: GPH1002 SP 4
Course Title: Modern Cartographic Techniques
Total Credits: 5 (L+T+P, 2+1+2)

The objective of the course is to offer hands-on experience on computer-assisted cartography or digital cartography. The course emphasises database management, processing of vector and raster data and use of digital elevation data for mapping. The course also covers concepts on Digital Image Processing (DIP), Image classification and computation of different indices for mapping and detecting changes over space and time.

On completion of the course, the students shall be able to,

CO1: Translate data from various sources to integrate, develop, edit and update geospatial data.

CO2: Analyse data using database system.

CO3: Use the concept of geospatial analysis and modelling tools in GIS software.

CO4: Analyze GIS-model interactions and design procedures for modelling with GIS

CO5: Apply the principle of image processing for remote sensing data analysis, resampling, image corrections and enhancements and generate high-level remote sensing products.

CO6: Construct different type of remote sensing data products and analysis technique to solve real-world problems.

Sl. No.	Content	No. of lectures
1	Development of computer assisted cartography/ digital cartography; map as data model, maps and data processing systems, maps and geometry, positional cartographic objects of zero, one two and three dimensions.	5
2	Data structure for modelling geographic reality: vector data – geometric, topological and feature components, data hierarchy and encoding, modelling of surfaces and solids; raster data model and TIN model – characteristics, use, relative advantages, and disadvantages	5
3	Data sources, characteristics, and cartographic uses: ground survey and global positioning systems, aerial photography, remote sensing, census; cartographic use, advantage and disadvantages of - digital cartographic databases of various agencies in U. S. A. and India, thematic databases, digital elevation data (GLOBE, GTOPO30, SRTM) from various sources	6
4	Data processing and analyzing system: GIS – components, structure and functions. database management functions; data entry, edit, validation, manipulation and analysis functions; data display and cartographic outputs; mapping of statistical data using GIS tools	6
5	Data processing and analyzing system: Digital Image Processing (DIP) – Image enhancement functions, band ratios – NDVI and soil moisture index; Image classification techniques	5
6	Cartographic abstraction, symbolization of feature attributes – point, line, area and volume. basic mapping techniques; understanding display colour models by electronic devices; basic consideration of colour and pattern use in map design; typography and lettering the map – functions and positioning guidelines	5

7	Practical: Use of SRTM data for profiling and contour mapping; (ii) Construction of DEM from topographical map. Digital vector mapping and representation of political boundaries, transport and communication lines, market centres, towns, and district headquarters etc.; (ii) Any three thematic maps using vector polygons of given areas. LU/LC map and (ii) NDVI Computation and mapping from IRS data /LANDSAT data using standard DIP software. Drawing of cartograms using GIS tools/ manual drawing; (ii) Visual interpretation of satellite data.	2 credit
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Reading list:

- *American Society of Photogrammetry*, 1960: Manual of Photographic Interpretation, Banta Publishing Co., Menasha, Wisconsin.
- Anderson, J. R., et al., 1976: *A Landuse / Landcover Classification System for Uses with Remote Sensing Data*, USGS Professional Paper.
- Avery, T. E., 1963: *Interpretation of Aerial Photography*, Burgess Publishing Co., Minneapolis.
- Cromely, R. G., 1992: *Digital Cartography*, Prentice Hall Inc., Engle Wood Cliffs, New Jersey.
- Curtis, H., 2000: *The GPS Accuracy Improvement Initiative*, GPS World, June, 2000.
- Gopi, S., 2005: *Global Positioning System Principles and Applications*, Ta McGraw Hill, New Delhi.
- Jensen, J. R., 2011: *Remote Sensing of the Environment – An Earth Resource Perspective*, 3rd Impression, Pearson, New Delhi.
- Robinson, A. H.; Morrison, J. L.; Muehrcke, P. C.; Kimerling, A. J. And Guptill, S. C., 1995: *Elements of Cartography*, John Wiley & Sons Inc, New York.

Course Code:GPH 1002 SP 5

Course Title: Agricultural Geography of India

Total Credits: 5 (L+T+P, 2+1+2)

The course discusses centrality of agriculture in local, national, and global economy and critically understand different modes of agriculture, land use pattern and changes and outcomes, food availability, nutrition as well as associated problems and hazards of contemporary time towards the goal of ensuring sustainability. The course focuses on India as a whole and Northeast India in particular, to discuss developments in agriculture sector in recent times. The course also teaches certain methods to have indices of intensity, diversification, measures of composite index of development and agricultural regionalisation, in the pursuit to equip students with understanding and have measures for development planning.

Learning Outcome:

- CO1: Understand various concepts and concerns associated with agriculture and centrality of agriculture in contemporary context.
- CO2: Apply approaches and methods to quantify and evaluate and present development outcomes in the agriculture sector.

CO3: Analyse and evaluate policies and programmes in the sector.

Units	Content	No. of lectures
1	Place of Indian agriculture: in global economy, type, characteristics, growth, distribution and development; Critical appreciation of large scale and small scale agriculture, Agricultural regions of India and their characteristics.	8
2	Agricultural land use pattern and shifting cropping pattern in India; Regional variation in the levels of agricultural development in India - Food deficit and food surplus regions; nutritional index.	6
3	Problems of Indian agriculture: crop and cropping hazards, sustainability of agricultural practices and production	6
4	Contemporary Issues of Indian agriculture: Food, nutrition and hunger, food security, food aid programmes; environmental degradation; role of irrigation, fertilizers, insecticides and pesticides, technological know-how.	6
5	Agriculture in Northeast India – Agriculture as an economic basis of North East India; major food crops and cash crops produced; problems and prospects of agriculture in North East India with special reference to Assam	6
6	Practical: Agricultural regionalization: linkage method and composite index method, Crop diversification, intensity of cropping: Index of cropping intensity, Composite index of agricultural development. Intensity of cropping in various districts of Assam.	2 credit

Reading list:

- Bayliss Smith, T. P., 1987: *The Ecology of Agricultural Systems*. Cambridge University Press, London.
- Berry, B. J. L. et. al., 1976: *The Geography of Economic Systems*. Prentice Hall, New York, 1976.
- Brown, L.R.: *The Changing World Food Prospects - The Nineties and Beyond*. World Watch Institute, Washington D.C., 1990.
- Das, M. M., 1984: *Peasant Agriculture in Assam: A Structural Analysis*, InterIndia Publications, New Delhi.
- Dyson, T.: *Population and Food - Global Trends and Future Prospects*. Routledge, London, 1996.
- Singh, J. and Dhillon, S.S.: *Agricultural Geography*, Tata McGraw Hill Pub., New Delhi, 1988.
- Sukla, S. P. and Agarwal, A.K.: *Agriculture in North East India*.
- Whittlesey, D., 1936: *Major Agricultural Regions of the World*, Annals of the Association of American Geographers, 26.

Course Code: GPH1002 SP 6
Course Title: Social Geography of India
Total Credits: 5 (L+T+P= 2+1+2)

This course introduces and discusses the myriad dimensions of society, social structure and systems in India and the process of evolution. The outcomes in wellbeing front at present times are also discussed and measured across social groups and gender. In doing so the course focuses on socially and culturally diverse region of northeast region of India.

After completion of the course the students will be able to:

- CO1: Understand social systems of in India,
- CO2: Discuss the process of social change in India.
- CO3: Analyse and apply the concepts and measures of social wellbeing.
- CO4: Locate public policies and programme on social sector development in India.
- CO5: Design survey methods and approaches of social area analysis including preparation of indices and mapping.

Unit	Content	No. of lectures
1	Social differentiation and region formation, social structure and social stratification as reflected in race, tribe, caste, language, dialect and religion in India; Indian unity and diversity.	4
2	Social evolution in India: The pre-history and historic scene with special reference to the Janapadas of ancient India and the Mughal Subahs. Social change in India: effects of sanskritization, westernization and modernization.	6
3	Social well-being: Concepts of social well-being, physical quality of life, Human development; measurement of human development with social, economic and environmental indicators; Rural urban disparity in India with respect to health care; education and shelter; deprivation and discrimination issues relating to women and underprivileged groups	8
4	Public policy and social planning in India: review of five year plans and area plans towards social policy in India; strategies to improve social well-being in tribal, hill, drought and flood prone areas; social and environmental impact assessment of development projects.	8
5	Geographical diversity in social composition, problems of identity consciousness, questions of regionalism and nationalism in contemporary North-East India, cultural diversity in North-east India: Bases of cultural diversity-race, religion and language. Ethnic groups and tribal groups of North-East India	6
6	Practical: Social Survey Methods, Social area analysis by composite 'Z' score, Social interaction and diffusion patterns, Diversity Index (Simpson's Method), Distribution and concentration pattern among social groups (India/N.E. India/Assam), disparity mapping of population characteristics and social well-being, world distribution of races, religious hearths, migration of population	2 credit

Reading list:

- Ahmad, A., 1999: *Social Geography*, Rawat Publication, Jaipur and New Delhi.
- Ahmad, A. (ed), 1993: *Social Structure and Regional Development: A Social Geography perspective*, Rawat Publication, Jaipur.
- Noble, A. G. and Dutta, A. K. (eds): *India: Cultural Pattern and Processes*, West View Press, Colorado.
- Srinivas, M.N., 1986: *India: Social Structure*, Hindustan Publishing Corporation, Delhi.
- Pecion, M., 1987: *Social Geography: Process and Prospect*, Croom Helm, London.
- Smith, D.M., 1977: *Human Geography: A Welfare Approach*, Edward Arnold, London.
- Sopher, D.E. (ed): *An Exploration Of India: Geographical Perspectives on Society and Culture*, Longman, London

Course Code: GPH1003 OP 1

Course Title: Geography of Tourism

Total Credit: 4 (L+T+P= 3+1+0)

The drive to development of tourism sector though reflects as an indicator of crisis in a space; considering the high demand for travel for leisure and recreational activities the sector plays significant role in development of livelihood avenues if a space has constraints to generate livelihood from the traditional livelihood sectors. In such context the policies and programmes of the state needs to be coherent towards ensuring sustainability of the spaces willing to promote tourism. This course discusses the growth and development of tourism in certain sectors, understand the role of national and global tourism development organisations, outcome on natural environment and prospects of eco-tourism in the context of negative externalities generate on environment by the tourism sector in recent times.

After completion of the course the students will be able to

CO1: Understand critically the role of tourism in the development of an area.

CO2: Locate and Discuss the problems and prospects of tourism in a specific ecological settings

CO3: Evaluate institutional regulatory measures for development of the sector.

Unit	Content	No. of lectures
1	Definition and types of tourism, elements and factors of tourism, tourism as an industry.	8
2	Growth of tourism in India: problems and prospects. case studies on coastal tourism, rural tourism and urban tourism	12
3	Spatial pattern of tourism: global and regional, tourism organizations: WTO, ICAO, IATA, PATA, UFTAA, TAAI, IATO, ITDC, ATDC	10
4	Environment: meaning, components and role of natural environment on tourism, tourism and environmental change, sustainable tourism, environmental laws and tourism	12

5	Eco-tourism and its prospects in Northeast India.	6
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Reading List:

- Allan M Williams and Shaw Gareth: *Tourism and Economic Development*, Belhaven Press, London
- Bhatia, A.K.: *International Tourism; Fundamentals and Practices*, Sterling Publishers Pvt. Ltd, New Delhi
- Bhatia, A.K.: *Tourism Development; Principles and Practices*, Sterling Publishers Pvt. Ltd, New Delhi
- Bhatia, A.K.: *Tourism in India*, Sterling Publishers Pvt. Ltd, New Delhi
- Chattopadhyay K.: *Economic Impact of Tourism Development: An Indian Experience*, Kanishka Publishers, Delhi
- Dhaliwal G. S. & Kukal, S. S.: *Essentials of Environmental Science*, Kalyani Publishers, New Delhi
- Gupta V. K.: *Tourism in India*, Gian Publishing House, Delhi
- Misra S. N. & Sadual S. K.: *Basics of Tourism Management*, Excel Books, New Delhi
- Pearce D G 1987: *Tourism Today: A Geographical Analysis*, Harlow, Longman
- Prabu P. C. Udayasoorian C. & Balasubramanian G.: *An Introduction to Ecology and Environmental Science*, Avinash Paperbacks, Delhi
- Sharma J K (ed), 2000: *Tourism Planning and Development- A New Perspective*, Kaniska Publishers, New Delhi
- Sharma K.C.: *Tourism, Policy Planning Strategy*, Pointer Publishers, Jaipur
- Sharma K. K. : *Tourism in India (Centre State Administration)*, Classic Publishing House, Jaipur
- Sharma and Sharma: *Discovery of North East India (11 Volumes)*, Mittal Publishers, New Delhi
- Singh R.: *Dynamics of Modern Tourism*, Kanishka Publishers, New Delhi.

Course Code: GPH 1004DPW

Title: Dissertation

Credits = 6 (Tutorials -2; Field Work 4)

Field-based project work requires critical engagement to work on a topic of contemporary concern under supervision of a faculty member. The students for the work on dissertation shall get opportunity to apply the tools and techniques learned during the post graduate programme and exposure to advanced theoretical learning from the review of literature and policy and programme documents mandated to incorporate in the empirical study. The students are expected to use a wide range of secondary data collected by the surveillance system the state. This course shall prepare the students for advanced research at Ph.D. level and the results and findings could contribute to the domain of public policy.

The specific learning outcomes of the course are-

CO 1- Identify social, economic, physical, and environmental issues.

CO 2- Apply theoretical knowledge to analyse and interpret the issues.

CO 3- Develop framework to address the social, economic, and environmental concerns.