BANASTHALI VIDYAPITH

Master of Arts (Geography)
Master of Science (Geography)

Curriculum Structure

First Semester Examination, December-2019
Second Semester Examination, April/May-2020
Third Semester Examination, December-2020
Fourth Semester Examination, April/May-2021

BANASTHALI VIDYAPITH
P.O. BANASTHALI VIDYAPITH
(Rajasthan)-304022

July, 2019

103

No. F. 9-6/81-U.3

Government of India
Ministry of Education and Culture
(Department of Education)

New Delhi, the 25th October, 1983

N O T I F I C A T I O N

In exercise of the powers conferred by Section 3 of the University Grants Commission Act, 1956 (3 of 1956) the Central Government, on the advice of the Commission, hereby declare that Banasthali Vidyapith, P. O. Banasthali Vidyapith, (Rajasthan) shall be deemed to be a University for the purpose of the aforesaid Act.

Sd/-
(M. R. Kolhatkar)
Joint Secretary of the Government of India

N O T I C E

Changes in Bye-laws/Syllabi and Books may from time to time be made by amendment or remaking, and a Candidate shall, except in so far as the Vidyapith determines otherwise, comply with any change that applies to years she has not completed at the time of change.

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Programme Educational Objectives

Banasthali Vidyapith is an epitome of tradition and modernity. Vidyapith aims to preserve and inculcate the essential values and ideals of Indian culture. It believes in simple living and high thinking. Our educational ideology is based on the concept of fivefold education focusing on physical, practical, aesthetic, moral and intellectual aspects in order to develop a balanced personality.

Geography studies the earth in relation to mankind. Man's lifestyle is influenced by physical aspects in its immediate surroundings and Geography act as a bridge between man and its environment. Geography is also related to human dimension wherein man using the resources and creates its economic dimension. Various arenas of human aspects such as business, trade, commerce, agriculture, industry, navigation, military operations, spacecraft and administration needs Geography as a foundation.

Master's in Geography provides knowledge about scientific methods and facts from physical and human geography, particularly biogeography, climatology, oceanography, remote sensing, economic and resource geography, population geography, morphometric analysis, regional development & planning and geoinformatics. Furthermore students will gain profound knowledge of current research problems, approaches, and insights regarding the interactions between the environment and society in the context of global change. Students learn to integrate scientific theories, findings, and procedures in order to analyze and model human-environmental systems.

The main objectives of the Post Graduate Geography programme are:

- To illustrate the atmospheric and hydrospheric phenomenon of the earth, geographical dimensions of India, regional development and planning at national & state level.
- To explain contribution of various scholars in the evolution and origin of the discipline along with paradigms, concepts, approaches and social relevance revolutions.
- To develop skills in surveying and explain standard quantitative methods for research in physical and socio- economic aspects.
- To use Geographic Information Systems (GIS), particularly for the purpose of map making, classification, 3D analysis etc.
- To minimize negative impacts of agriculture, mining, industries, urbanization etc. by conveying concept of environmental protection and conservation.
- To develop gender-neutral attitudes and practices; respect for all races, nations, religions, cultures, languages and traditions.
- To raise sensitivity for ethical codes of conduct, social values with help of eco-feminism, gender equality, social balance and respect for each strata of the society.

Program Outcomes

PO1: Geography Knowledge: Explain geomorphic processes involved in landform development, resource distribution, and concept of geographical grid, cosmogony, cosmology and geographical thoughts and concepts; Students have knowledge of atmosphere and hydrosphere as well as the importance of regional planning and associated developmental phenomenon. Analyze drainage basins and their linear, areal and relief aspects. Students can identify, delineate watershed area and extent of erosion to plan for its management.

PO2: Planning abilities: Apply surveying techniques with the help of theodolite, dumpy level, total station and GPS for mapping and planning of any area.

PO3: Design/development of solution for problems: Development is solution oriented. The program enables them to use several research techniques in portraying the problem at regional national and world forums. The capability to generate solution to most common social, economic, and environmental problems is developed among the future handlers of the society.

PO4: Problem analysis: Apply Statistical techniques for data analysis, computation and its representation. Students will become familiar with standard quantitative methods, enabling them to accurately understand the meaning of information and how this information can be used to understand economic and social issues.

PO5: Modern tool usage: Use remote sensing and GIS techniques in medical, urban & rural settlements, environment, agriculture, resource, tourism and several other aspects from a geographical perspective. The applications can further enhance research in the discipline and contribute towards a better living environment.

PO6: Leadership skills: Fieldwork is an essential component and an ideal setting in which teamwork and leadership skills are developed in young geographers. Geographical Investigations test hypothesis and involve spatial and temporal analysis. Geographers are used to manipulating and interpreting data and preparing reports regarding several aspects of human and physical environment.

PO7: Professional Identity: understand, analyze and contribute towards the discipline adopting professions as a researcher, teacher, cartographer, climatologist, meteorologist and planner.

PO8: Geographical Ethics: Apply ethical principles in personal, professional and social levels. Honor personal values and apply ethical principles in professional and social contexts. Demonstrate behavior that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.

PO9: Communication: Communicate effectively with the Earth Science community and with society at large, such as, being able to comprehend and write effective, make effective presentations and documentation, and give and receive clear instructions.

PO10: The Geographer and society: Create awareness in society about the conservation and management of Resources; Understand spatial distribution, socio-cultural, economic and administrative aspects of various tribes and races at regional and global level and their problems; Describe and understand political, social, agriculture, population and related problems associated with society and environment.

PO11: Environment and sustainability: Understand resource production, distribution and trade at regional and global level and join hands towards sustainable development of the society.

PO12: Life- long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self-access and use feedback effectively from others to identify learning needs and to satisfy theses needs on an ongoing basis.

Curriculum Structure

Master of Arts (Geography)
Master of Science (Geography)

First Year

Semester-I

Course Code	Course Name	L	T	P	C*
GEOG 401	Advance Geomorphology	5	0	0	5
GEOG 404	Economic and Resource Geography	5	0	0	5
GEOG 405	Geographical Thoughts and Concepts	5	0	0	5
GEOG 407	Introduction to Geography	5	0	0	5
GEOG 402L	Cartographic Techniques Lab	0	0	12	6
Semester Total:		**20**	**0**	**12**	**26**

Semester-II

Course Code	Course Name	L	T	P	C*
GEOG 403	Climatology	5	0	0	5
GEOG 406	Geography of India	5	0	0	5
GEOG 409	Oceanography	5	0	0	5
GEOG 410	Regional Development and Planning	5	0	0	5
GEOG 408L	Morphometric Analysis Lab	0	0	12	6
Semester Total:		**20**	**0**	**12**	**26**

Second Year

Semester-III

Course Code	Course Name	L	T	P	C*
GEOG 504	Political Geography	5	0	0	5
GEOG 507	Research Methodology and Quantitative Techniques	5	0	0	5
GEOG 510	Systematic Agricultural Geography	5	0	0	5
GEOG 509L	Surveying Lab	0	0	12	6
	Discipline Elective - I	5	0	0	5
	Reading Elective - I	0	0	0	2
Semester Total:		**20**	**0**	**12**	**28**

Semester-IV

Course Code	Course Name	L	T	P	C*
GEOG 501	Environmental Geography	5	0	0	5
GEOG 506	Remote Sensing and GIS	5	0	0	5
GEOG 516L	Remote Sensing and GIS Lab	0	0	12	6
	Discipline Elective - II	5	0	0	5
	Open Elective	5	0	0	5
	Reading Elective - II	0	0	0	2
	Semester Total:	**20**	**0**	**12**	**28**

List of Discipline Electives

Course Code	Course Name	L	T	P	C*
GEOG 502	Geography of Rural Settlements	5	0	0	5
GEOG 503	Medical Geography	5	0	0	5
GEOG 511	Tourism Geography	5	0	0	5
GEOG 512	Urban Geography	5	0	0	5
GEOG 505	Population Geography	5	0	0	5
GEOG 508	Social Geography	5	0	0	5

Lis of Reading Electives

Course	Code	Course Name	L	T	P	C*
ENVS	512R	Agroforestry	0	0	0	2
ENVS	513R	Energy Resources and Conservation	0	0	0	2
ENVS	515R	Man and Environment	0	0	0	2
ENVS	517R	Water and Sustainable Development	0	0	0	2
GEOG	513R	Environmental Challenges and Disaster Management	0	0	0	2
GEOG	514R	India: Socio-Political and Environmental Scenario	0	0	0	2
GEOG	515R	Rajasthan: Challenges and Prospects	0	0	0	2
GEOG	517R	Transforming India	0	0	0	2
GEOL	514R	Geo Tourism	0	0	0	2
GEOL	517R	Indian Mineral Deposits, Economics and Mining Ethics	0	0	0	2
GEOL	518R	Innovation and Entrepreneurship in Earth Sciences	0	0	0	2
GEOL	521R	Natural Hazards and Disasters	0	0	0	2

List of Online Reading Electives

Course Code	Course Name	L	T	P	C*
	Non-Conventional Energy Resources	0	0	0	2
	Mineral Resources: Geology, Exploration, Economics and Environment	0	0	0	2
	Natural Hazards Part-I	0	0	0	2

*** L - Lecture hrs./week; T - Tutorial hrs./week; P-Project/Practical/Lab/All other non-classroom academic activities, etc. hrs./week; C - Credit Points of the Course**

Student can opt open (Generic) elective from any discipline of the Vidyapith with prior permission of respective heads and time table permitting.

Every Student shall also opt for:

Five Fold Education: Physical Education I, Physical Education II, Five Fold Education: Aesthetic Education I, Aesthetic Education II, Five Fold Education: Practical Education I, Practical Education II one each semester

Five Fold Activities

Fine Arts		Physical Education and Sports	
BVFF 101	Classical Dance (Bharatnatyam)	BVFF 201	Aerobics
BVFF 102	Classical Dance (Kathak)	BVFF 202	Archery
BVFF 103	Classical Dance (Manipuri)	BVFF 203	Athletics
BVFF 104	Creative Art	BVFF 204	Badminton
BVFF 105	Folk Dance	BVFF 205	Basketball
BVFF 106	Music-Instrumental (Guitar)	BVFF 206	Cricket
BVFF 107	Music-Instrumental (Orchestra)	BVFF 207	Equestrian
BVFF 108	Music-Instrumental (Sarod)	BVFF 208	Flying - Flight Radio Telephone Operator's Licence (Restricted)
BVFF 109	Music-Instrumental (Sitar)	BVFF 209	Flying - Student Pilot's Licence
BVFF 110	Music-Instrumental (Tabla)	BVFF 229	Aeromodelling
BVFF 111	Music-Instrumental (Violin)	BVFF 210	Football
BVFF 112	Music-Vocal	BVFF 211	Gymnastics
BVFF 113	Theatre	BVFF 212	Handball
		BVFF 213	Hockey
Social Service and Extension Activities		BVFF 214	Judo
BVFF 301	Banasthali Sewa Dal	BVFF 215	Kabaddi
BVFF 302	Extension Programs for Women Empowerment	BVFF 216	Karate – Do
BVFF 303	FM Radio	BVFF 217	Kho-Kho
BVFF 304	Informal Education	BVFF 218	Net Ball
BVFF 305	National Service Scheme	BVFF 219	Rope Mallakhamb
BVFF 306	National Cadet Corps	BVFF 220	Shooting
		BVFF 221	Soft Ball
		BVFF 222	Swimming
		BVFF 223	Table Tennis
		BVFF 224	Tennis
		BVFF 225	Throwball
		BVFF 226	Volleyball
		BVFF 227	Weight Training
		BVFF 228	Yoga

Evaluation Scheme and Grading System

Continuous Assessment (CA) (Max. Marks)					End-Semester Assessment (ESA) (Max. Marks)	Grand Total (Max. Marks)
Assignment		Periodical Test		Total (CA)		
I	II	I	II			
10	10	10	10	40	60	100

In all theory, laboratory and other non classroom activities (project, dissertation, seminar, etc.), the Continuous and End-semester assessment will be of 40 and 60 marks respectively. However, for Reading Elective, only End semester exam of 100 marks will be held. Wherever desired, the detailed breakup of continuous assessment marks (40), for project, practical, dissertation, seminar, etc shall be announced by respective departments in respective student handouts.

Based on the cumulative performance in the continuous and end-semester assessments, the grade obtained by the student in each course shall be awarded. The classification of grades is as under:

Letter Grade	Grade Point	Narration
O	10	Outstanding
A+	9	Excellent
A	8	Very Good
B+	7	Good
B	6	Above Average
C+	5	Average
C	4	Below Average
D	3	Marginal
E	2	Exposed
NC	0	Not Cleared

Based on the obtained grades, the Semester Grade Point Average shall be computed as under:

$$SGPA = \frac{CC_1 * GP_1 + CC_2 * GP_2 + CC_3 * GP_3 + ---- + CC_n * GP_n}{CC_1 + CC_2 + CC_3 + ---- + CC_n} = \frac{\sum_{i=1}^{n} CC_i * GP_i}{\sum_{i=1}^{n} CC_i}$$

Where n is the number of courses (with letter grading) registered in the semester, CC_i are the course credits attached to the i^{th} course with letter grading and GP_i is the letter grade point obtained in the i^{th} course. The courses which are given Non-Letter Grades are not considered in the calculation of SGPA.

The Cumulative Grade Point Average (CGPA) at the end of each semester shall be computed as under:

$$CGPA = \frac{CC_1 * GP_1 + CC_2 * GP_2 + CC_3 * GP_3 + ----+ CC_n * GP_n}{CC_1 + CC_2 + CC_3 + ----+ CC_n} = \frac{\sum_{i=1}^{n} CC_i * GP_i}{\sum_{i=1}^{n} CC_i}$$

Where n is the number of all the courses (with letter grading) that a student has taken up to the previous semester.

Student shall be required to maintain a minimum of 4.00 CGPA at the end of each semester. If a student's CGPA remains below 4.00 in two consecutive semesters, then the student will be placed under probation and the case will be referred to Academic Performance Review Committee (APRC) which will decide the course load of the student for successive semester till the student comes out of the probationary clause.

To clear a course of a degree program, a student should obtain letter grade C and above. However, D/E grade in two/one of the courses throughout the UG/PG degree program respectively shall be deemed to have cleared the respective course(s). The excess of two/one D/E course(s) in UG/PG degree program shall become the backlog course(s) and the student will be required to repeat and clear them in successive semester(s) by obtaining grade C or above.

After successfully clearing all the courses of the degree program, the student shall be awarded division as per following table.

Division	CGPA
Distinction	7.50 and above
First Division	6.00 to 7.49
Second Division	5.00 to 5.99
Pass	4.00 to 4.99

CGPA to % Conversion Formula: % of Marks Obtained = CGPA * 10

First Semester

GEOG 401 Advance Geomorphology

Max. Marks : 100	**L**	**T**	**P**	**C**
(CA: 40 + ESA: 60)	**5**	**0**	**0**	**5**

Learning Outcomes:

After the completion of this course, students should be able to:

- Analyze the relation between geomorphological processes and landscape formation.
- Explain the structure of earth's interior.
- Describe endogenetic and exogenetic activities transforming the earth.
- Apply geomorphological knowledge in research related to land-use, mining and agriculture.

Course Content:

Section A

Geomorphology and Theories in Geomorphology

Geomorphology - Nature and scope; Development of geomorphological thought; The Earth's interior - Structure and constitution, recent views; Theories in Geomorphology- Theory of Isostasy- the concept of Sir George Airy and Pratt; Theories of Orogenesis – Geosynclines Orogen theory of Kober; Continental drift theory of A.G. Wegner.

Section B

Endogenetic Process

Plate tectonics- concept; plate margins and boundaries and distribution of plates; Endogenetic processes - Faulting, Folding and their geomorphic expressions; Earthquake- Concept, causes, classification, intensity and magnitude, geographical distribution; Volcanism- Concept, mechanisms and causes; Volcanoes- Classification, volcanic materials, topography associated with volcanicity and geographical distribution of volcanoes; Rocks and types of rocks.

Section C

Exogenetic Process and Regional Geomorphology

Exogenetic Process- Weathering, Mass wasting and Erosion – meaning, type and controlling factors; Geomorphic processes and resulting landforms-Fluvial, Arid, Glacial, Karst and Coastal; Application of Geomorphology to human activities:Land-use, Mining, Agriculture.

Stencils are to be permitted during the examination.

Recommended Books:

1. Bloom, A. L. (2009). *Geomorphology* (3rd ed.). New Delhi, India: Prentice Hall.
2. Chorley, R. J., Schumm, S. A., & Sugden, D. E. (1984). *Geomorphology*. London, UK: Methuen.
3. Dayal, P. (2010). *A Text Book of Geomorphology* (5th ed.). New Delhi, India: Kalyani.
4. Fairbridge, R. W. (Ed.). (1968). *Encyclopedia of Geomorphology*. New York, NY: Reinhold Book Corporation.
5. Gregory, K. J., & Walling, D. E. (1973). *Drainage Basin Form and Process*. London, UK: Edward Arnold.
6. Gutierrez, M. (2013). *Geomorphology.* London, UK: Taylor and Francis.
7. Huggett, R.J.(2018). *Fundamentals of Geomorphology.* New York, NY: Routledge
8. Husain, M. (2002). *Fundamentals of Physical Geography* (4th ed.). Jaipur, India: Rawat.
9. Kale, V., & Gupta, A. (2010*). Introduction to Geomorphology.* Hyderabad, India: Orient Longman.
10. Singh, S. (2013). *Geomorphology* (5th ed.). Allahabad, India: Prayag Pustak Bhawan.
11. Strahler, A. N. (2016). *Introducing Physical Geography* (6th ed.). New York, NY: John Wiley & Sons.

12. Thornbury, W. D. (2002). *Principles of Geomorphology* (2nd ed.). New Delhi, India: John Wiley & Sons.

13. दयाल,पी. (2010). *भू आकृति विज्ञान* (तृतीय सं.). नई दिल्ली, भारतः राजेश.

14. शर्मा, एच. एस., शर्मा, एम. एल., एवं मिश्रा, आर. एन. (2014). *भौतिक भूगोल.* जयपुर, भारतः पंचशील.

15. सिंह, एस. (2008). *भू आकृति विज्ञान* (सप्तम् सं.). गोरखपुर, भारतः वसुन्धरा.

Suggested e-learning materials:

1. Plate Tectonics, Weathering, Mass Wasting and Erosion
   http://hkss.cedd.gov.hk/hkss/eng/education/GS/eng/hkg/chapter4.htm
2. Geomorphic Processes
   http://ncert.nic.in/ncerts/l/kegy206.pdf

GEOG 404 Economic and Resource Geography

Max. Marks : 100	**L**	**T**	**P**	**C**
(CA: 40 + ESA: 60)	**5**	**0**	**0**	**5**

Learning Outcomes:

After the completion of this course, students should be able to:

- Describe and develop the approaches to economic and resource geography.
- Describe the resource related issues, map them systematically.
- Explain the interference of world trading blocs in international economics.
- Describe the non-conventional resources and their usability and apprise public about the depletion of resources.

Course Content:

Section A

Economic Geography: An Introduction

Definition and scope of Economic Geography, Approaches to the study of Economic Geography: Systematic, Regional, System Analysis, Behavioral, Welfare and Environmental; Sectors of Economy: Primary, Secondary, Tertiary and Quaternary; Factors affecting the location of economic activities; Trade: Evolution of International Trade, Factors affecting International trade, World Trading Blocs: NAFTA, EUROPEAN UNION, OPEC and SAARC.

Section B

Mineral and Energy Resources

Meaning and concept of resource; Classification of resources – on the basis of availability, distribution & frequency of occurrence and use of resources; Production and distribution of mineral resources: Iron ore and copper; Energy Resources: Conventional Resources; Coal: Uses of coal, Principal coalfields of the world, Production of coal in the world; Decline of coal in world fuel supplies; Petroleum: Origin and uses of Oil, Distribution of oilfields in the world, Production and Trade of Oil in the world, Petroleum Reserves and the future of the Oil industry;Non – Conventional Resources: Solar, Wind.

Section C

Industries and Locational Theories

History of Industrial Development; classification of industries; Location Theories: Weber and Losch; Iron and Steel Industry; changing location of the Iron and Steel Industry; Cotton Textile Industry: Distribution, Production and Trade in the world.

Stencils are to be permitted during the examination.

Recommended Books:

1. Gautam, A. (2010). *Advanced Economic Geography*. Allahabad, India: Sharda Pustak Bhawan.

2. Guha, J. L., & Chattoraj, P. R. (2009). *Economic geography – A Study of Resources* (9th ed.). Kolkata, India: The World Press.

3. Hartshorn, T. A., & Alexander, J. W. (2009). *Economic Geography* (8th ed.). New Delhi, India: Prentice Hall.

4. Leong, G. C., & Morgan, G. C. (2010). *Human and Economic Geography* (2nd ed.). New Delhi, India: Saurabh.

5. Siddharth, K. (2018). *Economic Geography* (3rd ed.). Allhabad, India: Kitab Mahal.

6. गौतम, ए. (2015). *आर्थिक भूगोल.* मेरठ, भारतः रस्तोगी.

7. जाट, बी. सी. (2016). *आर्थिक भूगोल* (चतुर्थ सं.). जयपुर, भारतः पंचशील.

8. मामोरिया, सी. (2012). *आर्थिक भूगोल* (द्वितीय सं.). आगरा, भारतः साहित्य भवन.

9. सिंह, के. (1978). *मानव और आर्थिक भूगोल* (द्वितीय सं.). वाराणसी, भारतः तारा.

10. सिंह, के. (2009). *आर्थिक भूगोल के मूलतत्व : संसाधन उपयोग, संरक्षण एवं आर्थिक विकास का अध्ययन* (11 वाँ सं.) वाराणसी, भारतः ज्ञानोदय.

11. सिंह, के. एन., एवं सिंह,जे. (2010). *आर्थिक भूगोल के मूलतत्व* (11 वाँ सं.). गोरखपुर, भारतः ज्ञानोदय.

12. सिंह, जे. (2009). *संसाधन भूगोल.* नई दिल्ली, भारतः राधा.

Suggested e-learning materials:

1. International trade
   https://gspp.berkeley.edu/assets/uploads/research/pdf/ssrn-id1783908.pdf

2. NAFTA
   https://idatd.cepal.org/Normativas/TLCAN/Ingles/North_American_Free_Trade_Agreement-NAFTA.pdf

GEOG 405 Geographical Thoughts and Concepts

Max. Marks : 100	**L**	**T**	**P**	**C**
(CA: 40 + ESA: 60)	**5**	**0**	**0**	**5**

Learning Outcomes:

After the completion of this course, students should be able to:

- Analyze the work of several scholars and their contribution to the field.
- Analyze the historical works and extract geographical information from them.
- Describe the concepts, paradigms and models in Geography.
- Develop an individual approach towards the subject.

Course Content:

Section A

Development of Geographical Thought

Ancient period: Indian, Greek and Roman contribution with special reference of Aryabhatta, Eratosthenes and Ptolemy; Medieval period: contribution of Arab scholars with special reference of Al-Masudi, Al-Biruni; Modern period: Contribution of German (Humboldt, Ritter, Ratzel), French (Blache, Brunhes), British (Mackinder), American (Semple, Sauer), Soviet (Peter Kropotkin) Scholars.

Section B

Concepts, Paradigms and Models in Geography

Concept of dualisms in Geography- Physical vs. Human Geography, Systematic vs. Regional Geography; Meaning of Paradigms, Paradigm shift and Changing Paradigms of Geography; Models- Meaning, Definition, Characteristics, Types and Utility; Scientific Explanation in Geography; System analysis- Meaning, structure and types.

Section C

Contemporary Development

Quantitative Revolution in Geography; Welfare Geography; Radical Geography; Gender Geography.

Stencils are to be permitted during the examination

Recommended Books:

1. Daniels, P., Bradshaw, M., Shaw, D., & Sidaway, J. (2008). *An Introduction to Human Geography: Issues for the 21st Century* (3rd ed.). London, UK: Prentice Hall.

2. Dikshit, R. D. (2018). *A Contextual History of Ideas* (2nd ed.). New Delhi, India: PHI.

3. Hussain, M. (2014). *Evolution of Geographical thought* (6th ed.). New Delhi, India: Rawat .

4. Kaushik, S. D., & Rawat. D. S. (2017). *Geographical thought and Methodology*. Meerut, India: Rastogi.

5. Martin, G. (2007). *All Possible Worlds. A History of Geographical Ideas* (4th ed.). New York, NY: Oxford University Press.

6. Maurya, S. D. (2013). *History Of Geographical Thought.* Allahabad, India: Sharda Pustak Bhawan.

7. Rana, L. (2008). *Geographical thought A systematic record of evolution*. New Delhi, India: Concept.

8. Singh, M. (2016). *Geographical Thought*. New Delhi, India: Sonali.

9. कौशिक, एस. डी., एवं रावत, डी. एस. (2017). *भौगोलिक विचारधारा एवं विधि तंत्र* (नवम् सं.). मेरठ, भारतः रस्तोगी.

10. जैन, एस. एम. (2018). *भौगोलिक चिन्तन का विकास* (संशोधित सं.). आगरा, भारतः साहित्य भवन.

11. प्रसाद, जी. (2006). *भौगोलिक संकल्पनाएँ.* नई दिल्ली, भारतः डिसकवरी.

12. मौर्य, एस. डी. (2015). *भौगोलिक चिन्तन का इतिहास.* इलाहाबाद, भारतः प्रयाग पुस्तक भवन.

13. सिंह, जे. (2009). *भौगोलिक चिन्तन के मूल आधार.* नई दिल्ली, भारतः वसुन्धरा.

14. हुसैन, एम. (2006). *भौगोलिक चिन्तन का इतिहास.* जयपुर, भारतः रावत.

Suggested e-learning materials:

1. Dualism
   https://epgp.inflibnet.ac.in/ahl.php?csrno=17 P-06, M-16
2. System Analysis
   https://epgp.inflibnet.ac.in/ahl.php?csrno=17 P-06, M-26
3. Quantitative Revolution
   https://epgp.inflibnet.ac.in/ahl.php?csrno=17 P-06, M-25
4. Explanation in Geography
   https://epgp.inflibnet.ac.in/ahl.php?csrno=17 P-06, M-32
5. Gender Geography
   https://epgp.inflibnet.ac.in/ahl.php?csrno=17P-06, M-33

GEOG 407 Introduction to Geography

Max. Marks : 100	**L**	**T**	**P**	**C**
(CA: 40 + ESA: 60)	**5**	**0**	**0**	**5**

Learning Outcomes:

After the completion of this course, students should be able to:

- Describe the nature of the subject and understand the geographical knowledge in ancient civilizations.
- Develop an understanding of latitudes, longitudes, rotation, revolution, day and night and seasons.
- Explain human dimensions in geography in context of several tribes and their economic activities.
- Know the human adaptation to the environment in relation to several tribes.

Course Content:

Section A

Geography its nature and development

Geography- Nature, Meaning, Scope and branches; Main regions of geographical knowledge in Ancient Time with special reference to Indus Valley and Mesopotamia; Cosmogony in ancient India; Cosmology in ancient India; Geographical knowledge in ancient India (description of physical and human geography).

Section B

Physical Dimension in Geography

Brief introduction of the Universe and solar system; Origin of Earth, The Shape of earth- Evidence of the earth sphericity; The earth as a Rotating planet and effects of earth rotation (day and night, season); The Geographic Grid- (Latitude, Longitude, World Time zone, International Date Line); Phases of moon, Solar and Lunar eclipse.

Section C

The Human and Applied Dimension of Geography

Evolution of man, human races, classification and distribution according to G. Taylor; Human adaptation to the environment with special reference to Eskimos, Bushman and Gujjars; Early economic activities of mankind with special reference to gathering, Hunting and shifting cultivation; Man Environment: Changing relation with respect to population size; Remote Sensing & GIS: Introduction and its application.

Stencils are to be permitted during the examination.

Recommended Books:

1. Chauniyal, D. D. (2010). *Remote Sensing and Geographical Information System*. Allahabad, India: Sharda Pustak Bhawan.

2. Dikshit, R. D. (2019). *Geographical Thought- A contextual History of Ideas* (2nd ed.). Delhi, India: Prentice Hall.

3. Haq, M. (1995). *Reflection on Human Development*. New Delhi, India: Oxford University Press.

4. Husain, M. (2002). *Fundamentals of Physical Geography* (2nd ed.). New Delhi, India: Rawat.

5. Husain, M. (2014). *Evolution of Geographical Thought*. Jaipur, India: Rawat.

6. Jean, D., & Sen, A. (1995). *Economic Development and Social Opportunity*. New Delhi, India: Oxford University press.

7. Johnston, R. J. (Ed.). (1983). *Philosophy and Human Geography: An Introduction to Contemporary Approaches*. London, UK: Edward Arnold.

8. Lownsburg, J. F., & Aldrich, F. T. (1979). *Introduction to Geographical Methods and Techniques*. Columbus, OH: Charles Marrili.

9. Matthews, J. A., & Herbert, D.T. (2008). *Geography: A very short introduction*. New York, NY: Oxford University Press.

10. Singh, L. R. (2009). *Fundamentals of Human Geography* (2nd ed.). Allahabad, India: Sharda Pustak Bhawan.

11. Singh, S. (2006). *Physical Geography*. Allahabad, India: Prayag Pustak Bhawan.

12. कौशिक, एस. डी. (2011). *मानव भूगोल के सरल सिद्धांत* (12वाँ सं.). मेरठ, भारतरू रस्तोगी.

13. मौर्य, एस. डी. (2010). *भौगोलिक चिन्तन का इतिहास* (तृतीय सं.). इलाहाबाद, भारत: प्रयाग पुस्तक भवन.

14. हुसैन, एम. (2012). *मानव भूगोल* (चतुर्थ सं.). जयपुर, भारत: रावत.

Suggested e-learning materials:

1. Human adaptation to the environment with special reference to Bushman
   http://www.newworldencyclopedia.org/entry/Bushmen

2. Solar and Lunar eclipse
   https://spaceplace.nasa.gov/eclipses/en/

GEOG 402L Cartographic Techniques Lab

Max. Marks : 100	**L**	**T**	**P**	**C**
(CA: 40 + ESA: 60)	**0**	**0**	**12**	**6**

Learning Outcomes:

After the completion of this course, students should be able to:

- Diagrammatically display secondary and primary data through diagrams for all three dimensions.
- Have an understanding of map projections which further helps in cartography.
- Interpret toposheets and open series maps for applied aspects.
- Use the tools of cartography for research purpose.

Course Content:

Cartography – Techniques and Tools of Cartography.

1. Introduction and Interpretation of Topographical maps, calculate nearest neighbour analysis.
2. Profiles – The method of drawing a profile, Types of profiles – serial, superimposed, projected, composite.
3. Mathematical Construction of Map Projections:-
4. Conical Projections:
   - Simple conical projection with one standard Parallel
   - Conical projection with two standard parallel.
   - Bonne's Projection
   - Polyconic Projection
5. Cylindrical Projections:
   - Cylindrical equidistant projection
   - Mercator's projection
6. Zenithal Projections:
   - Polar zenithal equal area projection
   - Orthographic polar Zenithal projection

7. Conventional Projection: - Mollweide's Projection
8. Representation of Statistical data using Microsoft Excel
9. Geological Maps: Determination of Dip and Strike.

Non – scientific calculators are allowed during the examination.

Recommended Books:

1. Mishra, R. P.,& Ramesh, A. (2002). *Fundamentals of Cartography*. New Delhi, India: Concept.
2. Saha, P., & Basu, P. (2011). *Advanced Practical Geography*. Kolkatta, India: Books and Allied.
3. Singh, L. R. (2011). *Fundamentals of Practical Geography*. Allahabad, India: Sharda Pustak Bhawan.
4. Singh, R. L. (2011). *Elements of Practical Geography*. New Delhi, India: Kalyani.
5. तिवारी, आर. सी., एवं त्रिपाठी, एस. (2014). *अभिनव प्रयोगात्मक भूगोल.* इलाहाबाद, भारतः प्रवालिका.
6. भल्ला, एल. आर. (2006). *प्रयोगात्मक भूगोल.* अजमेर, भारतः कुलदीप.
7. शर्मा, जे. पी. (2012). *प्रायोगिक भूगोल* मेरठ. भारतः रस्तोगी.
8. सिंह, एल. आर. (2011). *मानचित्र एवं प्रयोगात्मक भूगोल.* इलाहबाद, भारतः सेन्ट्रल बुक डिपो.

Suggested e-learning materials:

1. Map Projection
   https://www.gislounge.com/map-projection/
2. Dip & Strike
   http://www.jsu.edu/dept/geography/mhill/phylabtwo/lab4/dipf.html

Second Semester

GEOG 403 Climatology

Max. Marks : 100	**L**	**T**	**P**	**C**
(CA: 40 + ESA: 60)	**5**	**0**	**0**	**5**

Learning Outcomes:

After the completion of this course, students should be able to:

- Describe climate and climatic factors such as temperature, pressure, insolation and their distribution.
- Describe the origin and location of winds with world map.
- Explain Air masses, fronts, Jet streams and their impacts.
- Explain the relation of climate with agriculture, urban planning and health.

Course Content:

Section A

Climatology and Structure of Atmosphere

Definition & scope of Climatology; Structure and composition of Atmosphere, Insolation and heat budget of the earth; Distribution of Global Temperature: Vertical and Horizontal, Temperature inversion; Atmospheric Equilibrium: Stability and Instability; Distribution of atmospheric pressure: pressure belts and winds.

Section B

Special Weather Phenomenon

Jet streams and monsoon winds; Ocean atmospheric interaction: EL-Nino, Southern Oscillation and La-Nina; Atmospheric moisture: Humidity, evaporation and condensation, Precipitation: Types and world pattern of Precipitation; Concepts of Air masses: Types and distribution; Fronts: Origin, growth and classification of fronts. Frontogenesis and Frontolysis.

Section C

Disturbances and Applied Climatology

Cyclones: Tropical and Temperate; Anticyclones: Types of anticyclones, blocking highs; Climate Types and their distribution; Global climatic changes: Indicators and Theories - Astronomical or Orbital Theories, Theories Involving Change in the Composition of Atmosphere, Theories Involving Change in Solar Radiation; Applied Climatology: Climate and Agriculture; Climate and Housing, Climate and diseases, Climate and Urban planning

Stencils are to be permitted during the examination.

Recommended Books:

1. Agarwal, S. K. (2013). *Global Warming and Climate Change (Past, Present and future).* New Delhi, India: A. P. H.
2. Critchifield, J. H. (2009). *General Climatology* (4thed.). Delhi, India: Prentice Hall.
3. Hussain, M. (2003). *Climatology*. New Delhi, India: Anmol.
4. Lal, D. S. (2014). *Climatology*. Allahabad, India: Sharda Pustak Bhawan.
5. Malhotra, R. (2010). *Climatology*. New Delhi, India: Global Vision.
6. Mehtani, S., & Sinha, A. (2010). *Climatology*. New Delhi, India: Commonwealth.
7. Singh, S. (2006). *Physical Geography*. Allahabad, India: Prayag.
8. Strahler, A. N. (2016). Introducing Physical Geography (6thed.). New York, NY: John Wiley & Sons.
9. Strahler, A. N., & Strahler, A. H. (1977). *Geography and Man's environment*. New York, NY: John Wiley & Sons.
10. लाल, डी. एस. (2009). *जलवायु विज्ञान.* इलाहाबाद, भारतः शारदा पुस्तक भवन.
11. शर्मा, एच. एस. (2014). *भौतिक भूगोल.* जयपुर, भारतः पंचशील.

12. सिंह, एस. (2013). *जलवायु विज्ञान* (अष्ट सं.). इलाहबाद, भारतः प्रयाग पुस्तक भवन.

Suggested e-learning materials:

1. Cyclones
   https://www.imdtvm.gov.in/index.php?option=com_content&task=view&id=15&Itemid=30
2. EL Nino
   https://www.nationalgeographic.org/encyclopedia/el-nino/

GEOG 406 Geography of India

Max. Marks : 100	**L**	**T**	**P**	**C**
(CA: 40 + ESA: 60)	**5**	**0**	**0**	**5**

Learning Outcomes:

After the completion of this course, students should be able to:

- Demarcate India physiographically into major divisions and understand seasons prevailing in the country.
- Locate the several mineral, energy and industrial resources on country's map.
- Describe demographic structure of India.
- Describe the geography of Rajasthan, its resources and problems.

Course Content:

Section A

Physical Features

Physiographic divisions of India: Evolution, Division and Significance of each division; Major river systems of India: Himalayan and the Peninsular river systems; Seasons of India: detail study of Monsoon; Climatic regions of India: Koeppen's climatic regions; Soils of India, major problems and methods of soil conservation.

Section B

Economic & Human Resources

Major mineral resources: Iron ore, manganese and mica; Energy resources: conventional (coal) and non-conventional (solar, wind); Major industries: Iron-steel, cotton textile industries and Industrial regions of India and their problems; Population: Growth, distribution, Composition: density, sex ratio; Means of Transport: Road and Rail.

Section C

Geography of Rajasthan

Physiographic Divisions; Climate; Drainage System; New comprehensive system of Soil Classification; Live stock (Sheep and Camel) and Dairy development.

Stencils are to be permitted during the examination.

Recommended Books :

1. Bhalla, L. R. (2016). *Geography of Rajasthan* (12th ed.) Jaipur, India: Kuldeep.
2. Khullar, D. R. (2014). *India, A Comprehensive Geography (*3rd ed.). Ludhiyana, India: Kalyani.
3. Mishra, V. C. (1967). *Geography of Rajasthan*. New Delhi, India: National Book Trust.
4. Singh, G. (2010). *Geography of India* (9th ed.). Delhi, India: Atma Ram.
5. बंसल, एस. सी. (2015). *भारत का भूगोल* (तृतीय सं.). मेरठ, भारत: मीनाक्षी.
6. मामोरिया, सी. (2018). *भारत का वृहत भूगोल.* आगरा, भारत: साहित्य भवन.
7. शर्मा, आर. (2014). *राजस्थान का वृहत भूगोल* (द्वितीय सं.). उदयपुर, भारत, हिमाशुं.

8. शर्मा एच. एस., एवं शर्मा, एम. एल. (2017). *भारत का नूतन भूगोल.* जयपुर, भारतः आर. बी. डी.

9. शर्मा, एच. एस., एवं शर्मा, एम. एल. (2017). *राजस्थान का भूगोल* (13वाँ सं.). जयपुर, भारतः पचंशील.

10. सक्सैना, एच. (2014). *राजस्थान का भूगोल* (12वाँ सं.). जयपुर, भारत: राजस्थान हिन्दी ग्रंथ अकादमी.

11. सक्सैना, एच. एम., सक्सैना, आर., एवं सक्सैना, पी. (2017). *भारत का भूगोल.* जयपुर, भारत: रावत.

12. सिंह, जी. (2006). *भारत का भूगोल.* दिल्ली, भारत: आत्माराम.

13. हुसैन, एम. (2018). *भारत का भूगोल* (सप्तम् सं.). नई दिल्ली, भारत : टाटा मैक्ग्राहिल.

Suggested e-learning materials:

1. Detail study of Monsoon
   http://www.imd.gov.in/pages/monsoon_main.php
2. Climate of India
   http://www.indiaenvironmentportal.org.in/files/climate_profile.pdf

GEOG 409 Oceanography

Max. Marks : 100	**L**	**T**	**P**	**C**
(CA: 40 + ESA: 60)	**5**	**0**	**0**	**5**

Learning Outcomes:

After the completion of this course, students should be able to:

- Describe the scope of oceanography and morphology of ocean bottoms of Pacific, Atlantic and Indian oceans.
- Have knowledge about the density, salinity, temperature and its distribution in the oceans.
- Explain Coral Reefs, its types and origin.
- Describe the dynamics of the ocean and marine resources.

Course Content:

Section A

Introduction to Oceanography

Oceanography: Definition and Scope; The morphology of the Ocean Bottom: Hypsometric Curve; Bottom Reliefs of Pacific, Atlantic and Indian Oceans; Temperature of the Ocean: Factors affecting the Horizontal distribution of surface Temperature of the oceans, Importance of the ocean water Temperature; Heat Budget of the Oceans, Annual and Diurnal Range of Temperature.; Horizontal and Vertical distribution of Temperature.

Section B

Oceanic Salinity, Density and Deposits

Salinity of Ocean Water: Meaning, Sources and Controlling factors; Horizontal and Vertical distribution of Salinity; Density of Ocean Water: Meaning & controlling factors; Horizontal and Vertical distribution of Density; Ocean Deposits: Meaning and Types

Section C

Circulation of Oceanic Water and Coral Reefs

Ocean Currents: Definition, Types of ocean Currents. Generating and Modifying factors of Ocean Currents; The Currents of the Pacific, Atlantic and Indian Ocean; Tides: Tide producing Forces, Types of Tides, Theories of Ocean Tides: Equilibrium Theory, Progressive Wave Theory and Stationary Wave Theory; Coral Reefs: Required Conditions of Coral Growth, Types of Coral Reefs; Theories of Coral Reef Formation: Darwin's Subsidence Theory, The Non- Subsidence - Theory of Murray; Man and Marine Resources, Marine Pollution: causes, effects measures; Laws of Ocean Protection (UNEP).

Stencils are to be permitted during the examination.

Recommended Books :

1. Gohchengleong. (2011). *Certificate Physical and Human Geography*. New Delhi, India: Oxford University Press.
2. King, C. A. (1965). *Oceanography for Geographers*. London, UK: Edward Arnold.
3. Khullar, D. R. (2014). *Physical Geography.* Ludhiana, India: Kalyani.
4. Murray, S. J. (1913). Ocean, *A General account of the Science of the sea.* London, UK: Thorton Butter Worth.
5. Sharma, R. C., & Vatal, M. (2011*). Oceanography for Geographers*. Allahabad, India: Chaitanya.
6. Siddartha, K. (2010). *The Earth's Dynamic surface:A textbook on Geomorphology*. New Delhi, India: Kisalya.
7. Siddhartha, K. (2014). *Oceanography. A Brief Introduction*. New Delhi, India: Kisalaya.
8. Singh, S. (2004).*Geomorphology*. Allahabad, India: Prayag.
9. Strahler, A. N., & Strahler, A. H. (2008). *Modern Physical Geography* (4thed.). New Jersey, N.J. : John Wiley & Sons.
10. लाल. डी. एस. (2013). *समुद्र विज्ञान.* इलाहाबाद, भारतः शारदा पुस्तक भवन .
11. शर्मा एच. एस. (2008). *भौतिक भूगोल.* जयपुर, भारतः पंचशील.
12. सिंह, एस. (2005). *भौतिक भूगोल का स्वरूप.* गोरखपुर, भारतः वसुन्धरा.

Suggested e- learning materials:

1. Tides
   https://www.britannica.com/science/tide
2. Coral reefs
   https://www.britannica.com/science/coral-reef
3. Ocean bottom reliefs
   https://www.britannica.com/place/Pacific-Ocean

GEOG 410 Regional Development and Planning

Max. Marks : 100	**L**	**T**	**P**	**C**
(CA: 40 + ESA: 60)	**5**	**0**	**0**	**5**

Learning Outcomes:

After the completion of this course, students should be able to:

- Describe planning, its types and need.
- Explain region as a concept and describe its types.
- Delineate and demarcate regions with statistical techniques.
- Measure development statistically and have an understanding of development programmes currently existing in the county.

Course Content:

Section A

Concept of Planning and Region

Concept of Planning and its types; Levels of Planning and Need for Planning; Concept of region and its types; Delineation of Regions: Formal regions (Weighted Index method, Factor Analysis method and Composite Index method); Functional regions (Gravitational Analysis and flow analysis).

Section B

Planning Regions and Theoretical Framework

Concept of Planning Regions: Characteristics of Planning Regions; Hierarchy of Planning Regions; The need for planning regions and demarcation of planning regions with special reference to India; Theoretical framework of Regional Planning: Central Place Theory, Growth Pole Theory.

Section C

Development and Regional Disparities

Concept of Development: Indicators and Measurement of Human Development; Historical Perspective of Planning in India – Pre and Post-Independence under the Planning era; Five Year Plans in India: Current five year plan; Regional Disparities in India: Concept of imbalances and inequalities in India, Regional disparities with special reference to agriculture in Rajasthan; Development Programmes in India: Desert Development Programme and Aravalli Development Programme.

Non – scientific calculators are allowed during the exam & stencils are to be permitted during the examination.

Recommended Books:

1. Bhalla, L. R. (2015). *Geography of Rajasthan*. Jaipur, India: Kuldeep.
2. Chand, M.,&Puri, V. K. (1983). *Regional Planning in India.* New Delhi,India: Allied.
3. Chandana, R. C. (2000). *Regional Planning*. Ludhiana, India: Kalyani.
4. Chandana, R. C. (2014). *Regional Planning and Development*. New Delhi, India: Kalyani.
5. Chaudhuri, R. J. (2009). *An Introduction to Development and Regional Planning with special reference to India*. Hyderabad, India: Orient Blackswan.
6. Mishra, R. P. (2002). *Regional Planning concepts, Techniques, Policies and Case studies.* New Delhi, India: Concept.
7. Nath, V.(Ed.). (2009). *Regional Development and Planning in India* New Delhi, India: Concept.
8. Nath,V. (2011). *Administration and Development Planning in India.* New Delhi, India: Concept.
9. Shekhar, S. (2004). *Regional Planning in India.* New Delhi, India: Anmol.
10. Singh, G. (2017). *Regional Planning and Sustainable Development.* Jaipur, India : Shruti.

Suggested e-learning materials:

1. Desert Development Programmes

   http://dolr.gov.in/desert-development-programme-ddp

2. Five year plans in India

   http://planningcommission.nic.in/plans/planrel/fiveyr/ welcome.html

GEOG 408L Morphometric Analysis Lab

Max. Marks : 100	**L**	**T**	**P**	**C**
(CA: 40 + ESA: 60)	**0**	**0**	**12**	**6**

Learning Outcomes:

After the completion of this course, students should be able to:

- Relate river actions and the topography of the region.
- Calculate linear, areal, relief and slope related parameters.
- Analyse the nature of river, its structure, direction of flow.
- Analyse the drainage basin, erosional work of any river and its impact over the landscape.

Course Content:

Morphometric Analysis of Drainage Basin :

Selection and delineation of a watershed;

1. Linear Aspects: Mapping of stream network, stream ordering based on Horton and Strahler, Bifurcation ratio
2. Areal Aspects: Basin area, parameter and length, Geometry of basin shape, Calculation and mapping of stream frequency and drainage density.
3. Relief Aspects: Hypsometric analysis- Percentage hypsometric curve, area-height curve and Calculation and mapping of relative relief (Smith's method).
4. Slope Analysis - Calculation and mapping of average slope (Wentworth's method), area-slope curve and slope ogive.

Scientific calculators are allowed during the examination.

Recommended Books:

1. Singh, R. L. (2011). *Elements of Practical Geography* (8^{th} ed.). New Delhi, India: Kalyani.
2. Singh, S. (2010). *Geomorphology*. Allahabad, India: Prayag Pustak Bhawan.

3. Yadav, K. P. (2008). *Applications of Morphometry in Geomorphology*. New Delhi, India: Radha.

4. तिवारी, वी. (2010). *प्रायोगिक भूगोल* आगरा, भारतः रामप्रसाद एण्ड संस.

5. पाण्डेय, ए. (2010). भू आकृतिक विश्लेषण की अभिनव प्रवृत्तियां. नई दिल्ली, भारतः डिस्कवरी.

6. मिश्रा, पी. एल. (2013). *प्रयोगात्मक भूगोल. नई दिल्ली, भारतः विश्वभारती.*

7. वर्मा, एल. एन., एवंलोढा, आर. एम. (1999). *प्रयोगात्मक भूगोल.* जयपुर, भारतः राजस्थान हिन्दी ग्रंथ अकादमी.

8. शर्मा, जे. पी. (2011). *प्रायोगिक भूगोल* (पंचम् सं.). मेरठ, भारतः रस्तोगी.

Suggested e-learning materials:

1. Watershed Atlas of India
   http://cgwb.gov.in/watershed/about-ws.html

Third Semester

GEOG 504 Political Geography

Max. Marks : 100	**L**	**T**	**P**	**C**
(CA: 40 + ESA: 60)	**5**	**0**	**0**	**5**

Learning Outcomes:

After the completion of this course, students should be able to:

- Develop an approach to study political geography.
- Describe growth of the states and concept of Geopolitics.
- Differentiate between state and nation and also explain geopolitical issues with special reference to Sino India and Indo Pak.
- Discuss world political and environmental issues.

Course Content:

Section A

Introduction to Political Geography and Geopolitics

Definition and scope of political geography; Approaches to the study of Political Geography – Political-Environmental approach, Power analysis approach, Functional approach and A unified Field Theory; Laws of Spatial Growth of states; Concept of Geopolitics.

Section B

Concept of States and Nation

States and Nation: A historical perspective; The elements of a State and difference between Nation and State; Concept and classification of Frontiers and Boundaries; Buffer states: Nepal and Bhutan; Concept of core areas.

Section C

Global Strategies and International Problems

Geo Strategic Hypothesis-Theory of Heartland and Rimland; The round world perspective: Global strategies in Air age; Concept of

Federalism and Politico- Geographic factor in rise of Indian federalism; International problems related with boundaries: Sino-India and India- Pakistan border; Environmental problems and world politics

Stencils are to be permitted during the examination.

Recommended Books:

1. Blacksell, M. (2005). *Political Geography*. London, UK: Routledge.
2. Chopra, G. (2006). *Political Geography*. New Delhi, India: Commonwealth.
3. Dixit, R. D. (2006). *Political geography, the Spatiality of Politics*. New Delhi, India: Tata McGraw-Hill.
4. Flint, C.,& Taylor, P. J. (2018). *Political Geography: World-economy, nation-state, and locality*(6th ed.). New Jersey, NJ: Pearson/Prentice Hall.
5. Gallaher, C., Dahlman, C. T., Gilmartin., M., &Mountz., A. (2012). *Key Concept in Political Geography*. California, CA: Sage.
6. Jones, R., Woods., Michael., & Jones., M. (2009). *An Introduction to Political Geography: Space, Place and Politics*. Abingdon, UK: Routledge.
7. Painter., Joe., Jeffrey., & Alex (2010). *Political Geography* (2nd ed.). California, CA: Sage.
8. Singh, I. (2006). *Political Geography*. New Delhi, India: Alfa.
9. Sukhwal, B. L. (1971). *India-A Political Geography*. New Delhi, India: Allied.
10. चौहान, पी. आर. (2010). *राजनीतिक भूगोल.* गोरखपुर, भारत: वसुन्धरा.
11. तिवारी, आर. सी. (2017). *राजनीतिक भूगोल.* इलाहाबाद, भारत: प्रवालिका.

12. सक्सैना, एच. (2010). *राजनीतिक भूगोल* (पंचम् सं.).मेरठ, भारत: रस्तोगी.

Suggested e-learning materials:

1. Geopolitics
   https://www.newworlencyclopedia.org/entry/Indo-pakistani Wars
2. International problems related with boundaries: India- Pakistan border
   http://www.newworldencyclopedia.org/entry/Indo-Pakistani_Wars

GEOG 507 Research Methodology and Quantitative Techniques

Max. Marks : 100	**L**	**T**	**P**	**C**
(CA: 40 + ESA: 60)	**5**	**0**	**0**	**5**

Learning Outcomes:

After the completion of this course, students should be able to:

- Analyse the importance of research in geography.
- Design a research proposal and have an understanding about its structure and collection techniques for primary and secondary data.
- Calculate measures of central tendency, dispersion and correlate two phenomenons.
- Test the hypothesis of varied samples sizes and nature.

Course Content:

Section A

Significance of Research

Significance of Research in Geographical Studies; Research – Selection & Identification of Research Problem; Research Design-Meaning, characteristics, steps and types; Hypothesis-Meaning, characteristics, types and testing; Data- sources, **levels,** collection techniques, processing and analysis.

Section B

Measures of Central Tendency

Frequency distribution: Histogram and Graphical Representation; Measures of Central tendency: mean, median and mode; coefficient of variation; Measures of Dispersion: Mean deviation, Standard deviation and quartile deviation; Correlation analysis: Karl Pearson's & Spearman's Rank Correlation; **Composite Index;** Sampling and its types.

Section C

Test of Significance

Student 't' test; Mann – Whitney U – Test ; 'F' test ; Chi Square test; Analysis of variance

Non – scientific calculators are allowed during the examination.

Recommended Books:

1. Ahuja, R. (2014). *Research Methods.* Jaipur, India: Rawat.
2. Alvi, Z. (2005). *Statistical Geography Methods and Applications.* Jaipur and New Delhi, India: Rawat.
3. Dadson, S. J. (2017). *Statistical Analysis of Geographical Data An Introduction.* New Jersey, N.J.: John Wiley & Sons.
4. Gupta, S. P. (2012). *Statistical methods*. New Delhi, India: Sultan Chand and sons.
5. Jackson, L. S. (2009). *Research Methods and Statistics*. New Delhi, India: Cengage Learning.
6. Kothari, C. R., & Garg, G. (2014). *Research Methodology Methods and Techniques* (3rd ed.). New Delhi, India: New age International.
7. Kumar, R. (2016). *Research Methods A step-by-step Guide for Beginners* (2nd ed.). Sydney, Australia: Pearson Education and Dorling Kindersley.
8. Mahmood, A. (2017). *Statistical Methods in Geographical studies* (6thed.). New Delhi, India: Rajesh.

9. Mishra, H. N., & Singh, V. P. (Eds.). (1998). *Research Methodology : Social, spatial and policy dimensions*. Jaipur, India: Rawat.

10. Rao, G. N. (2012). *Research Methodology and quantitative Methods.* Hyderabad, India: B.S.

11. Sarkar, A. (2013). *Quantitative Geography- Techniques and Presentations.* New Delhi, India: Orient Blackswan.

12. नागर, के. एन. (2018). *सांख्यिकीय के मूलतत्व.* मेरठ, भारत: मीनाक्षी.

Suggested e-learning materials:

1. Chi-square test
http://ocw.jhsph.edu/courses/fundepiii/PDFs/Lecture17.pdf

2. Measures of Dispersion
https://sol.du.ac.in/mod/book/view.php?id=1317&chapterid=1066

GEOG 510 Systematic Agricultural Geography

Max. Marks : 100	**L**	**T**	**P**	**C**
(CA: 40 + ESA: 60)	**5**	**0**	**0**	**5**

Learning Outcomes:

After the completion of this course, students should be able to:

- Describe approaches to study agricultural geography.
- Apprise farmers about new farming techniques, influencing patterns and environmental degradation caused by agriculture.
- Demarcate any region according to world classification systems through statistical techniques.
- Classify land on several parameters and discuss the nature of agricultural problems of the nation.

Course Content:

Section A

Nature & Scope of Agricultural Geography

Nature, scope and significance of Agricultural Geography; Approaches to the study of Agricultural Geography – Commodity Approach, Regional

Approach and systematic approach; Factors influencing patterns and farm techniques; Soils – Major soil types, distribution & their characteristics; Environmental degradation – Causes and consequences.

Section B

Agricultural Regions &Typology

Whittleseys's classification of Agricultural systems of the world; Agricultural location theory of Von-Thunen and their limitations; Concept of Agricultural regions and delimitation; Agricultural Typology-Kostrowicki; Methods of Delimitations of crop combination Region – J.C. Weaver's minimum deviation and K. Doi's least square method.

Section C

Modern Concepts of Agricultural Geography

Concepts in Agricultural Geography– Sustainable development, Social forestry, Agribusiness, and dryland farming; Land classification and land capability; Agricultural transformation in India posts Independence – Land reforms and land use policy; Green revolution its implications in India and impact of white revolution in India; Food deficit and surplus regions of India, Problems of Indian Agriculture, management and planning, National Agriculture Policy.

Stencils and non-scientific calculators are to be permitted during the examination.

Recommended Books:

1. Chauhan, D. S. (2010). *Agricultural Geography*, Jaipur, India: Ritu.

2. Gautam, A. (2012). *Agricultural Geography*, Allahabad, India: Sharda Pustak Bhawan.

3. Hussain, M. (2010). *Agricultural Geography,* New Delhi, India: Rawat.

4. Kostowickie (1983). *Agricultural Typology,* Warsaw, Poland: Polish Academy.

5. Leong, G. C., & Morgan, G. C. (2010). *Human and Economic Geography* (2nd ed.). New Delhi, India: Saurabh.

6. Ali, M., & Hanafi, Y. S. (2013). *Agricultural Geography* .Gorakhpur, India: Vasundhra.

7. Ali, M. (1979). *Dynamics of Agriculture Development in India*, Delhi, India: Concept.

8. Ali, M. (1981). *Situation of Agricultural Geography*. New Delhi, India: Rajesh.

9. Shafi, M. (2006). *Agricultural Geography*. Delhi, India: Baba BarkhaNath.

10. Singh, J., & Dhillon, S. S. (2004). *Agriculture* Geography (3rd ed.). New Delhi, India: Tata McGraw – Hill.

11. कुमार, पी., एवं शर्मा, के. (2008). *कृषि भूगोल* (अष्ट सं.).भोपाल, भारत: मध्य प्रदेश हिन्दी ग्रन्थ अकादमी.

12. गौतम, ए. (2009). *कृषि भूगोल.* इलाहबाद, भारतः शारदा पुस्तक भवन.

13. हुसैन, एम. (2010). *कृषि भूगोल* (द्वितीय सं.) जयपुर, भारत: रावत.

Suggested e-learning materials:

1. White Revolution in India
http://lnweb90.worldbank.org/oed/oed
doclib.nsf/fb71ec897615187985256885007b6ad0/1bdd436f3bb1c0d68525684800767e4e/$FILE/India_Dairy.pdf

2. Agribusiness
http://www.isapindia.org/uploads_isap/annual_report/1010_Report-2016-17.pdf

GEOG 509L Surveying Lab

Max. Marks : 100	**L**	**T**	**P**	**C**
(CA: 40 + ESA: 60)	**0**	**0**	**12**	**6**

Learning Outcomes:

After the completion of this course, students should be able to:

- Handle the surveying instruments- Theodolite, dumpy level and Indian Clinometer.
- Measure the angles and survey different areas through triangulation and traverse method.
- Plot the longitudinal profile of any region through dumpy level.
- Conduct a field survey of any region.

Course Content:

1. Surveying: Definition, Classification, Principles and Errors.
2. Theodolite and Total Station Surveying: Introduction of Theodolite andTotalStationsurveying, Measurement of angles, Triangulation and Traverse method of Theodolite surveying; Surface generation and contour mapping by Total station; GPS
3. Dumpy level and Auto Level Surveying: Introduction of Dumpy and Auto level surveying. Observation and recording of staff reading. Methods of leveling, Plotting of longitudinal profile by Dumpy level data. Cut & fill and Line Leveling by Auto level.
4. Indian clinometer: Brief introduction of Indian clinometer, method of use and determining the heights of distant points.
5. Field Survey : Scientific calculators are allowed during the examination.

Recommended Books:

1. Duggal, S. K. (2015). *Surveying* (4th ed., Vol. I). New Delhi, India: McGraw Hill.
2. Ghilani, C. D., & Wolf, P. R. (2015). *Elementary surveying an introduction to geomatics* (14th ed.). New Jersey, NY: Pearson.

3. Kanetkar, T. P. (1985). *Surveying and Leveling* (23rd ed., Vol. I). Pune, India: Pune Vidyarthi Griha.

4. Mishra, R. P. (2014). *Fundamentals of Cartography* (2nded.). New Delhi, India: Concept.

5. Punmia, B. C., Jain, A. K., & Jain, A. K. (2016). *Surveying* (17th ed., Vol. I). New Delhi, India: Laxmi.

6. पुनमिया, बी. सी., जैन, ए. के., एवं जैन, ए. के. (2016). *सर्वेक्षण एवं क्षेत्र कार्य* (अष्ट सं., प्रथम भाग). नई दिल्ली, भारतः लक्ष्मी.

7. पुनमिया, बी. सी., जैन, ए. के., एवं जैन, ए. के. (2017). *सर्वेक्षण एवं क्षेत्र कार्य* (अष्ट सं., द्वितीय भाग). नई दिल्ली, भारतः लक्ष्मी.

8. शर्मा, जे. पी. (2013). *प्रायोगिक भूगोल* (चतुर्थ सं.). मेरठ, भारतः रस्तोगी.

Suggested e-learning materials:

1. Introduction to Surveying
   https://nptel.ac.in/courses/105107122/1
2. Introduction to Theodolite
   https://nptel.ac.in/courses/105107122/20
3. Theodolite Measurement
   https://nptel.ac.in/courses/105107122/22
4. Leveling basics
   https://nptel.ac.in/courses/105107122/13
5. Profile leveling
   https://nptel.ac.in/courses/105107122/14
6. Introduction to total station
   https://nptel.ac.in/courses/105107158/17

Fourth Semester

GEOG 501 Environmental Geography

Max. Marks : 100	**L**	**T**	**P**	**C**
(CA: 40 + ESA: 60)	**5**	**0**	**0**	**5**

Learning Outcomes:

After the completion of this course, students should be able to:

- Describe approaches to study environment.
- Describe several environmental cycles, food chain, pyramids and energy flow.
- Depict the consequences of pollution and hazards and suggest measures to control them.
- Create awareness about the need of biodiversity conservation.

Course Content:

Section A

Introduction to Environmental Geography

Definition and scope of Environmental Geography; Approaches to study of environment, Factors of the environment: Abiotic (Physiographic, Climatic, Edaphic); Factors of the environment: Biotic (Flora & Fauna); Bio Geochemical Cycles: The Carbon cycle, the Oxygen cycle, the Nitrogen cycle; The Hydrological cycle.

Section B

Concept of Ecology and Ecosystem

Concept of Ecosystem: With special reference to desert, forest and aquatic ecosystem; Food chain, Food web & succession; Ecological Pyramids and their types; Energy flow in ecosystem; Concepts of Biomes. Major biomes of the world: Tropical forest, Temperate forest, Grassland and Tundra.

Section C

Environmental Pollution and Hazards

Environmental Pollution-Pollutants and sources: Water pollution, Soil pollution, Air pollution and ,Noise pollution; Environmental Hazards-Natural hazards: Soil erosion, Landslides, Droughts and floods. Man-made hazards: Technological hazards: Nuclear and Industrial, Green house effects, Global warming and Ozone depletion; Biodiversity : Threats and conservation; Need of Environmental Management and Planning; Major environmental Movements (Chipko Movement, Silent Movement, Vishnoi Movement) and National Green Tribunal (NGT) Act, 2010; Concept of Environmental impact assessment (EIA).

Stencils are to be permitted during the examination.

Recommended Books:

1. Bharucha, E. (2013). *Textbook of Environmental Studies for Undergraduate Courses*. Hyderabad, India: Universities Press.
2. Desombre, R. E. (2007). *The Global Environment and World Politics*. New York, NY: Continuum International Publishing Group.
3. Gautam, A. (2010). *Environmental Geography*. Allahabad, India: ShardaPustakBhawan.
4. Jadhav, S. B. (2012). *Environmental Geography*. Kanpur, India: Chandralok.
5. Mehtani, S., & Sinha,A. (2010). *Biogeography*. New Delhi, India: Commonwealth.
6. Odum, E. P. (2005). *Fundamentals of Ecology* (5^{th} ed.). Philadelphia and London, UK: W.B. Sanders Company.
7. Rajagopalan, R. (2005). *Environmental Studies*: *From Crisis to Cure*. New Delhi, India: Oxford University Press.
8. Saxena, H. M. (2007). *Environmental Geography* (2^{nd}ed.). Jaipur, India: Rawat.
9. Singh, R. B. (Ed.). (1990). *Environmental Geography*. New Delhi, India: Heritage.

10. Singh, R. B. (Ed.). (1995). *Studies in Environment and Development.* Varanasi, India: Rakesh.

11. Singh, S. (2012). *Environmental Geography*. Allahabad, India: Prayag Pustak Bhawan.

12. William, M.W., & John, G. (2004). *Environmental Geography-Science, Landuse and Earth system* (3rd ed.). New York, NY: John Wiley & sons.

13. नेगी, पी. एस. (2014). *पारिस्थितिकी एवं पर्यावरण भूगोल* (चतुर्थ सं.). मेरठ, भारत: रस्तोगी.

Suggested e-learning materials:

1. Ozone depletion
   https://www.epa.gov/ozone-layer-protection/health-and-environmental-effects-ozone-layer-depletion

2. Global Warming
   https://www.nationalgeographic.com/environment/global-warming/global-warming-overview/

GEOG 506 Remote Sensing and GIS

Max. Marks : 100	**L**	**T**	**P**	**C**
(CA: 40 + ESA: 60)	**5**	**0**	**0**	**5**

Learning Outcomes:

After the completion of this course, students should be able to:

- Describe the concepts of aerial photography, Remote sensing and GIS.
- Develop background knowledge of platforms, sensors, thermal and microwave remote sensing.
- Describe concepts related to electromagnetic radiation, Spectral Signatures, thermal and microwave remote sensing.
- Apply Geospatial techniques in fields of cartography, environmental management, vegetation monitoring, forest cover depletion etc.

Course Content:

Section A

Aerial Photograph

Aerial Photographs: Definition,BasicTerms and Scale and Overlapping in aerial photographs; Classification of aerial photographs, their utility and Factors affecting the quality of an aerial photo; Fundamental of aerial photographs- Aerial camera, Time and season of photography, Planning and execution of photographic flight, Completion of photographic task; Elements of air photo interpretation and interpretation keys; Difference between aerial photograph and Topographical maps; Aerial photo mosaics

Section B

Remote Sensing

Remote sensing: Definition, process and stages; historical development; Remote sensing platforms and sensors; Remote sensing programmes of India; Electromagnetic Radiation (EMR) - Properties, Interaction of EMR with the earth's surface and atmosphere, Spectral signatures; Basic principles and applications of Thermal and Microwave Remote Sensing

Section C

GIS and GPS

GIS: Meaning and concept, historical development; Components of GIS; Data Structure and Data Models; Data Base Management System (DBMS), GIS **Data**manipulation and analysis; Basic Principles of GPS; GPS segments:GPS receivers; Application of GIS and GPS

Recommended Books:

1. Bhatta, B. (2011). *Remote Sensing and GIS* (2nd ed.). New Delhi, India: Oxford University Press.

2. Campbell, J, B., & Wynne, R. H. (2011). *Introduction to Remote Sensing* (5th ed.). New york, NY: Guilford

3. Ciciarelli, J. A. (1991). *A Practical Guide to Aerial Photography with an introduction to surveying*. New York, NY: Van Nostrand Reinhold.

4. Cracknell, A. P., & Hayer, L. (2009). *Introduction to Remote Sensing*, New York, NY: Taylor and Francis.

5. Ganesh, A., & Narayanakumar, R. (2006). *GPS Principles and Applications.* Delhi, India: Satish Serial.

6. George, J.,& Jeganathan, C. (2018). *Fundamentals of Remote Sensing* (3rd ed.). Hyderabad, India: Universities Press.

7. Gopi, S. (2013). *Global Positioning System- Principles and Applications.* New Delhi , India: McGraw Hill.

8. Kumar, S. (2014). *Basics of Remote Sensing and GIS*, New Delhi, India: University Science Press Laxmi.

9. Lillesand T. M., Kiefer, R. W., & Chipman, J. W. (2008). *Remote Sensing and Image Interpretation* (6th ed.).New York, NY: Wiley and Sons.

10. Lo, C. P., & Albert, K. W. Y. (2002). *Concepts and Techniques of Geographic Information System* (2nd ed.). New Delhi, India: Prentice-Hall.

11. Michael, N. D. (2000). *Fundamentals of Geographic information Systems*. New York, NY: John Wiley & Sons.

12. Nag, P., & Kudrat, M. (1998). *Digital Remote Sensing.* New Delhi, India: Concept

13. Paine, D. P., & Kisher, J. D. (2012). *Aerial Photography and Image Interpretation* (3rd ed.). Victoria, Australia: John Wiley & Sons.

14. Palet, A. N. (1992). *Remote Sensing Principles & Application*, Jodhpur, India: Scientific.

15. चौनियाल, डी. डी. (2010). *सुदूर सर्वेदन एवं भौगोलिक सूचना प्रणालीं.* इलाहबाद, भारतः शारदा पुस्तक भवन.

Suggested e-learning materials:

1. Concept of Aerial Photography
https://www.nrcan.gc.ca/earth-sciences/geomatics/satellite-imagery-air-photos/air-photos/about-aerial-photography/9687

2. Principles And applications of GIS
https://www.environmentalscience.org/principles-applications-gis

GEOG 516L Remote Sensing and GIS Lab

Max. Marks : 100	**L**	**T**	**P**	**C**
(CA: 40 + ESA: 60)	**0**	**0**	**12**	**6**

Learning Outcomes:

After the completion of this course, students should be able to:

- Perceive the depth through pocket stereoscope.
- Interpret the aerial photographs and generate Land use and Land cover map with the help of mirror stereoscope.
- Determine height, scale of aerial photographs.
- Georeference any map, create thematic maps, generate DEM and slope maps.

Course Content:

Photogrammetry:

1. Stereoscopic Vision Test: Zeiss test for depth perception.
2. Orientation of Aerial Photographs under mirror Stereoscope.
3. Determination of Scale, Stereoscopic Area, Principal point, Conjugate.principal point, Direction of Flight line and Air base.
4. Identification and Interpretation of objects/features from aerial photograph through mirror stereoscope.
5. Calculation of number of strips and number of photographs.
6. Height Determination using vertical aerial photographs.

GIS:

Basic software

1. Introduction to GIS software; Georefencing; Downloading of Satellite Imageries; Mosaicing; Subsetting; digitization Joining attribute data with spatial data, Creation of thematic maps.

2. Spatial Analysis, Classification (Supervised, Unsupervised and Accuracy Assessment), Proximity and Buffer analysis. 3D analysis in GIS: creation of aspect, Slope and DEM

   Non- scientific calculators are allowed in the examination.

Recommended Books:

1. Ciciarelli, J. A. (1991).*A Practical Guide to Aerial Photography with an Introduction to Surveying*.(1st ed.). New York, NY: Van Nostrand Reinhold.
2. Kang-tsung, C. (2007). *Geographic Information System*(4th ed.).New Delhi, India: Tata-McGraw Hill.
3. Lillisand, T. M., & Kiefer, P. W. (2015). *Remote Sensing & Image Interpretation*(7thed.).New York, NY: John Wiley & Sons.
4. Michael, N.D. (2001). *Fundamentals of Geographic information Systems*(1sted.).New York, NY: John Wiley & Sons.
5. Paine, D. P., & Kisher, J.D. (2012). *Aerial Photography and Image Interpretation* (3rded.). Victoria, Australia: John Wiley & Sons.
6. Sarkar, A. (2015). *Practical Geography A Systematic Approach* (3rd ed.). Kolkata, India: Orient Blackswan.
7. Singh, L. R. (2011), *Fundamentals of Practical Geography.* Allahabad, India: Sharda Pustak Bhawan.
8. Wolf, P. R., Dewitt, B. A., & Wilkinson, B. E. (2014). *Elements of Photogrammetry with Applications in GIS* (4thed.). New York, NY: Mc. Graw Hill Education.

Suggested e-learning materials:

1. Principles of Aerial Photography

   http://www.sfu.ca/~hickin/Maps/Chapter%208.pdf

2. Image classification
   http://www.csre.iitb.ac.in/~avikb/GNR401/DIP/DIP_401_ lecture_7.pdf

Discipline Electives

GEOG 502 Geography of Rural Settlements

Max. Marks : 100	**L**	**T**	**P**	**C**
(CA: 40 + ESA: 60)	**5**	**0**	**0**	**5**

Learning Outcomes:

After the completion of this course, students should be able to:

- Develop an approach to study rural settlements.
- Depict the evolution of settlements and relate it to the geographical factors.
- Describe rural morphology, its meaning and types.
- Describe house types, hierarchy of rural settlements and rural centers.

Course Content:

Section A

Introduction to Geography of Rural settlements

Meaning, definitions and scope of geography of rural settlements; The relationship of geography of rural settlements with other branches of geography, Approaches to geography of rural settlements; Factors affecting origin and evolution of settlements; Principles of Settlement Formation.

Section B

Morphology and Types of rural settlements

Rural settlements: Types and factors of development; Types of rural settlements in India and their Distribution; Rural Morphology: Meaning, definitions and Types; Process of development of rural morphology and affecting forces; Size, Density, Spacing and Dispersionof rural settlements.

Section C

Rural Dwellings and Service Centres

Houses: Definitions, factors affecting, classificationandmorphology; Distribution of houses in India on the basis of building material; Rural service centres: Definition,Identification and methods for the determination of hierarchy; Periodic markets: Definition, Characteristics and types.

Non-Scientific calculators &Stencils are to be permitted during the examination.

Recommended Books:

1. Chishlom, M. (2009). *Rural Settlement and Land Use*. New Jersey, NJ: Transaction.
2. Daniel, P. (1989). *The Geography of Settlement* (2nd ed.). Edinburg, Scotland: Oliver & Boyd.
3. Ghosh, S. (1998). *Geography of Settlements*. Kolkata, India: Orient Longman.
4. Mandal, R. B. (2001). *Introduction to Rural Settlement* (2nd ed.). New Delhi, India: Concept.
5. Mourya, S. D. (2014). *Settlement Geography*. Allahabad, India: Sharda Pustak Bhawan.
6. Oliver, P. (1987). *Dwellings: The House across the World*. Austin, TX: University of Texas Press.
7. Singh, R. Y. (2015). *Geography of Settlements*. New Delhi, India: Rawat.
8. Wanmali, S. (1983). *Service Centres in Rural India*: *policy, theory, and practice*. New Delhi, India: B. R.
9. तिवारी, आर. सी. (2016). *अधिवास भूगोल* (अष्ट सं.). इलाहबाद, भारतः प्रयाग पुस्तक भवन.
10. बंसल, एस. सी. (2016). *ग्रामीण बस्ती भूगोल* (संशोधित सं.). मेरठ, भारतः मीनाक्षी.

11. मौर्य, एस. डी. (2017). *अधिवास भूगोल* (षष्ठ सं.). इलाहबाद, भारतः शारदा पुस्तक भवन.

12. सिंह, आई. (2008). *अधिवास भूगोल.* नई दिल्ली, भारतः यूनिवर्सिटी.

13. सिंह, आर. (2005). *अधिवास भूगोल.* नई दिल्ली, भारतः रावत.

Suggested e-learning materials:

1. Introduction to rural settlement
https://books.google.co.in/books?id=SYQ1yydbDlwC&printsec=frontcover&dq=Introduction+to+rural+settlement&hl=hi&sa=X&ved=0ahUKEwiF1rOw55zhAhUZA3IKHRZpCUAQ6AEIKTAA#v=onepage&q=Introduction%20to%20rural%20settlement&f=false

2. Settlement patterns
https://www.britannica.com/place/India/Caste#ref487283

GEOG 503 Medical Geography

Max. Marks : 100	**L**	**T**	**P**	**C**
(CA: 40 + ESA: 60)	**5**	**0**	**0**	**5**

Learning Outcomes:

After the completion of this course, students should be able to:

- Depict spatial and temporal development of medical geography.
- Relate the course with other social sciences and develop an interdisciplinary approach.
- Relate natural, social and environmental factors with human health and diseases.
- Use statistical methods for assessing health.

Course Content:

Section A

Introduction to Medical Geography

Meaning, definitions and scope of Medical Geography; Spatio-temporal development of Medical Geography with special reference to India; Relationship of Medical geography with other disciplines – sociology,

psychology, economics, political science, law, natural science; Approaches to study Medical geography; Meaning of health (physical, mental and social health), health and hygiene, disease cycle, causes of ill health, disease ecology

Section B

Geographical Factors Affecting Human Health and Diseases

Natural factors – climate, relief, soil, vegetation; Social factors – population density, literacy, social customs and traditions and poverty; Economic Factors – occupation, standard of living, food security and nutrition; Environmental Factors – urbanization and congesting, water, air and noise pollution and solid waste; Factors influencing health in India; WHO classification of diseases and their distribution (major diseases) in world.

Section C

Human Health in India

Indicators of health - changes in Birth and death rates, Infant mortality rates, life Expectancy, changes in sex ratio, population growth, Population Control; Food: classification, food stuffs, balanced diet and Basal Metabolic Rate (BMR); Nutrition – mal nutrition & under nutrition – causes & consequences, status of food and nutrition in India and personal health; Heath care delivery system : areas of health education, tools for health education, Health Planning (aim, district level, block level, local level organizations); Health Care Programmes, Family Welfare Programmes, Family Planning Association of India (FPAI)

Stencils are to be permitted during the examination.

Recommended Books:

1. Akhtar, R. (1991). *Environment and Health:Themes in Medical Geography.* New Delhi, India: South Asia Books.
2. Akhtar, R. (Ed). (2016). C*limate Change and Human Health Scenario in South and Southeast Asia.* New Delhi, India: Springer Nature.
3. Hussain, M. (Ed). (1994). *Medical Geography*. New Delhi, India: Anmol.

4. May, J. M. (1970). *The World Atlas of Diseases*. New Delhi, India: Nat Book Trust.

5. Mayer, A. I. (2007). *Medical Geography*. New Delhi, India: APH.

6. Meade, M. S., & Earickson, R. J. (2006). *Medical Geography* (2nd ed.). New Delhi, India: Rawat

7. Mishra, R. P. (1969). *The Medical Geography of India*. New Delhi, India: National Book Trust.

8. Park, J. E., & Park, K. (2014). *Text Book of Community Health for Nurses*. Jabalpur, India: Ansari.

9. Park, J. E., & Park, K. (2007).*Preventive and Social Medicine*.(19th ed.).Jabalpur, India: M/s Banarsidas

10. सिंधई, जी. सी. (2010). *चिकित्सा भूगोल* (द्वितीय सं.).गोरखपुर, भारतः वसुन्धरा.

Suggested e-learning materials:

1. Indicators of Health
https://www.who.int/gho/publications/world_health_statistics/EN_WHS2015_Part2.pdf

2. Family Welfare programme in India
http://planningcommission.nic.in/plans/mta/mta-9702/mta-ch17.pdf

GEOG 511 Tourism Geography

Max. Marks : 100	**L**	**T**	**P**	**C**
(CA: 40 + ESA: 60)	**5**	**0**	**0**	**5**

Learning Outcomes:

After the completion of this course, students should be able to:

- Propagate the idea of ecotourism and sustainable tourism.
- Depict the social and economic benefits of tourism in any tourist site.
- Explain tourism potential of deprived places.
- Describe the tourism on national and state level.

Section A

Concept of Tourism Geography

Concept of Tourism: Definition, Evolution and types of Tourism; Tourism Geography: Definition, Key Concepts; Scale, Geographical components and spatial interaction between components; Geography of demand and supply for tourism; Development of tourism in India.

Section B

Geographic Foundation of Tourism

Introduction of geographic foundation of Tourism; Physical geography of Tourism: Resources and barriers; Human Geography of Tourism: Resources and barriers; Concept of Ecotourism.

Section C

Geographical factors affecting Tourism

Economic and Social benefits & cost of Tourism; Environmental benefits, cost of Tourism and emerging implications; Tourism in India: Demand, supply, organization and Tourism Resources; Ecological and cultural tourism resources of Rajasthan.

Stencils are to be permitted during the examination.

Recommended Books:

1. Bhatia, A. K. (2012). *Tourism Development: Principles and Practices* (2nded.). New Delhi, India: Sterling.
2. Boniface, B., Cooper, C., & Cooper, R. (2016). *Worldwide Destinations: The Geography of Trevel and Tourism* (7th ed., vol. I). New York, NY: Routledge.
3. Garg, D. (2009). *Geography of Tourism*. New Delhi, India: Mohit.
4. Jayapalan, N. (2013). *An Introduction to Tourism.* New Delhi, India: Atlantic.
5. Kamra, K. K. (2014). *Tourism An Overview*. New Delhi, India: Kanishka.
6. Kaushal, P., & Sharma, S. P. (2011). *Ecological and Environmental Impact of Tourism*. New Delhi, India: Kanishka.

7. Hall, M. C., & Page, J. S. (2014). *Geography of Tourism and Receration: Environment, Place and Space* (4th ed.). New York, NY: Routledge.

8. Nelson, V. (2017). *An Introduction to the Geography of Tourism* (2nd ed.). New York, NY: Rowman & Little field.

9. Sharma, S. P. (2011). *Tourism Education Principales, Theories and Practices* (2nd ed.). New Delhi, India: Kanishka.

10. अग्रवाल, वी. (2012). *भौगोलिक पर्यटन.* नई दिल्ली, भारतः अर्जुन.

11. नेगी,जे. (2013). *आधुनिक पर्यटन एवं यात्रा के आधारभूत सिद्धान्त* (चतुर्थ सं.). नई दिल्ली, भारतः तक्षशिला.

12. शर्मा, ए. (2012). *पर्यटन भूगोल.* जयपुर, भारतः इशिका.

13. शुक्ला, आर., एवं शुक्ला, आर. (2009). *पर्यटन भूगोल.* नई दिल्ली, भारतः अर्जुन.

14. सारण, बी. आर. (2008). *पर्यटन उत्पाद एवं प्रबन्ध.* नई दिल्ली, भारतः कनिष्क.

Suggested e- learning materials:

1. Cultural tourism in Rajasthan
   http://www.tourism.rajasthan.gov.in/
2. Economic benefits of Tourism
   http://pib.nic.in/newsite/PrintRelease.aspx?relid=175628
3. Tourist resources of India
   https://whc.unesco.org/en/statesparties/in

GEOG 512 Urban Geography

Max. Marks : 100	**L**	**T**	**P**	**C**
(CA: 40 + ESA: 60)	**5**	**0**	**0**	**5**

Learning Outcomes:

After the completion of this course, students should be able to:

- Depict the development of cities and relate with the classical theories of growth of cities.
- Describe the evolution and origin of cities.

- Classify cities functionally into different zones.
- Describe models in urban geography with special reference to the work of Christaller and Losch.

Course Content:

Section A

Introduction to Urban Geography

Meaning and scope of Urban Geography. Approaches to the study of Urban Geography, Development of Urban Geography; Stages of Evolution of Cities; Origin and evolution of towns: Origin, and growth of Ancient, Medieval and Modern towns (one example from each); Urbanization: Trends of Urbanization in World and India.

Section B

Urban Morphology

Urban Morphology: Meaning, affecting factors and stages of Development of Urban Morphology; Theories of Urban growth: Concentric zone theory of Burgess, Sector theory of Homer Hoyt and Multiple Nuclei theory of Harris& Ullman, Morphology of Indian Cities (one example.); Urban land use and functional zones of a city; Central Business District(CBD); Functional Classification of Cities according to C.D. Harris.

Section C

Models of Urban Geography

Concept of Urban Hierarchy: Methods of determination (on the basis of numbers and level of work); Rank size rule and the law of the Primate City; Central place theory of Walter Christaller and August losch; Rural urban fringe: Conceptual explanation, internal structure, characteristic features, Introduction of Conurbation and Umland, methods of delimitation of Umland (breaking point theory).

Stencils are to be permitted during the examination.

Recommended Books:

1. Bansal, S. C. (2015). *Urban Geography* (2nd ed.). Meerut, India: Meenakshi.
2. Daniel, P. (2002). *Geography of Settlement.* Jaipur, India: Rawat.
3. Ghosh, S. (1999). *Geography of Settlements*. Kolkata, India: Orient Longman.
4. Hussain, M. (2003). *Urban Geography*. New Delhi, India: Anmol.
5. Mandal, R. B. (2000). *Urban Geography* (2nd ed.). New Delhi, India: Concept.
6. Singh, R.Y. (2014). *Geography of Settlements* (2nd ed.). Jaipur, India: Rawat.
7. तिवारी, आर. सी. (2016). *अधिवास भूगोल* (अष्ट सं.). इलाहबाद, भारतः प्रयाग पुस्तक भवन.
8. बंसल, एस. सी. (2009). *नगरीय भूगोल.* मेरठ, भारतः मीनाक्षी.
9. मौर्य, एस. डी., एवं सिंह, आर.एन. (2013). *नगरीय भूगोल* (द्वितीय सं.). इलाहबाद, भारतः शारदा पुस्तक भवन.
10. सिंह, आई. (2008). *अधिवास भूगोल.* नई दिल्ली, भारतः यूनिवर्सिटी.
11. सिंह, आर. (2005). *अधिवास भूगोल.* जयपुर, भारतः रावत.

Suggested e-learning materials:

1. Origin and evolution of towns
   http://www4.brandonu.ca/ebertsd/281/281f17unit02.pdf
2. Functional Zones of a city
   http://egyankosh.ac.in/bitstream/123456789/27649/1/Unit-11.pdf

GEOG 505 Population Geography

Max. Marks : 100	L	T	P	C
(CA: 40 + ESA: 60)	5	0	0	5

Learning Outcomes:

After the completion of this course, students should be able to:

- Map the world in terms of density, distribution and other demographic aspects.
- Differentiate between demographic characteristics of developing and developed nations and factors posing that difference.
- Have a theoretical background about population growth and migration.
- Depict the trends of urbanization and demographic structure of India.

Course Content:

Section A

Scope of Population Geography & Demographic Characteristics of the World

Definition and scope of Population Geography and its relation with other sciences; Recent trends in Population Geography; Factors affecting the distribution and density of the world's population; Population growth and distribution in the world; Recent demographic characteristics of developed and developing nations.

Section B

Theories of Population Growth and Migration

Theories of Population Growth - Malthusian theory, Optimum population theory and Theory of demographic transition; Factors affecting population change, Population resource regions of the world; Migration: Major factors, consequences and types of migration; Theories of migration: Lee, Rewenstein and Zelinsky's model; Important migration of the world.

Section C

Population Geography in India

Development of Population Geography in India; Population change (birth rate and death rate), Population growth and internal migration; Demographic structure (sex ratio, literacy rate and occupation structure); Trends of urbanization in India; Population policy of India 2000.

Stencils are to be permitted during the examination.

Recommended Books:

1. Ahmad, A., Noin, D., & Sharma, H. N. (Eds.). (1997). *Demographic Transition- The third World Scenario*. Jaipur, India: Rawat.
2. Bhende, A. A., & Kanitkar, T.(2008). *Principles of Population Studies* (19th ed.). Mumbai, India: Himalaya
3. Chaubey, P.K. (2011). *Population Policy for India- prespectives, issues and challenges*. New Delhi, India: Kanishka.
4. Chandana, R. C. (2014). *A Geography of population* (11th ed.). New Delhi, India: Kalyani.
5. Chopra, G. (2006). *Population Geography*. New Delhi, India: Commonwealth.
6. Cox, P. R. (1993). *Demography* (5th ed.).New Delhi, India: Universal Book Stall.
7. Jay, W., & Pillai, V. K. (2017). *Demography- The Science of Population* (2nd ed.). Jaipur, India: Rawat.
8. Jhingon, M. L., Bhatt, B. K., & Desai, J. N. (2011). *Demography* (2nd ed.). New Delhi, India: Vrinda.
9. Premi, K. M.,& Das, D. N. (2012). *Population of India 2011*. Delhi, India: B.R.
10. Qazi, S. A. (2010). *Population Geography*. New Delhi, India: APH.
11. Srivastava, S. C., & Srivastava, S. (2004). *Studies in Demography.* New Delhi, India: Anmol.

12. Tripathi, R. K. (2007). *Population Geography*. New Delhi, India: Commonwealth.

13. Weinstein, J., Pillai, A., & Vijayan, K. (2017*). Demography- The Science of Population* (2nd ed.). Jaipur, India: Rawat.

14. पडां, बी. पी. (2007). *जनसंख्या भूगोल.* भोपाल, भारत: मध्यप्रदेश हिन्दी ग्रंन्थ अकादमी.

15. बंसल, एस. सी. (2015). जनसंख्या भूगोल (द्वितीय सं.). नई दिल्ली, भारतः आर. के.

Suggested e-learning materials:

1. Migration

   http://www.un.org/en/development/desa/population/migration/publications/migrationreport/docs/MigrationReport2017_Highlights.pdf

2. Demographic Data of India

   http://censusindia.gov.in/2011-prov results/data_files/india/Final_PPT_2011_chapter3.pdf

3. National Population Policy 2000
   https://mohfw.gov.in/sites/default/files/26953755641410949469%20%281%29.pdf

GEOG 508 Social Geography

Max. Marks : 100	**L**	**T**	**P**	**C**
(CA: 40 + ESA: 60)	**5**	**0**	**0**	**5**

Learning Outcomes:

After the completion of this course, students should be able to:

- Develop an approach to study social geography.
- Describe social processes, social strata's and organizations.
- Relate society and culture, understand cultural realms and regions.
- Analyze the current status of women in India and suggest measures for improvement.

Course Content:

Section A

Introduction to Social Geography

Meaning, Scope and Aims of Social Geography; Approaches to the study of social geography: Ecological approach, Regional approach, Historical approach, Welfare approach, System approach and Behavioral approach; Society: Definition, Origin and Classification of Society; Social Process: Forms of Social Interaction (Cooperation, Accommodation, Assimilation, Competition and Conflict); Social Stratification, Caste and Class; Social Organization and Groups.

Section B

Society and Culture

Society and Culture; Cultural Hearths; Cultural Diffusion: Definition, Elements and causes of diffusion. Barriers of diffusion, Effects and Types of diffusion. Hagerstand model of diffusion; Cultural Realms: Meaning of Cultural Realms, Basis of delimitation of cultural realms, Modern classification of the cultural realms; Cultural Regions of the world: Meaning and Bases of delimitation of cultural regions, Cultural Regions United States, U.K., Mesopotamia and Indian.

Section C

Social Geography in India

Social Geography of India: Indian Society in Historical Perspective; Status of Women in India; Social Change in India; Human Development in India; Social Planning in India: Meaning, Importance and Major Aspects of social planning; Social Welfare Programmes in Planned Period (Child Welfare Programme, Women Welfare Programme, Labour Welfare Programme, Family Planning and Family Welfare Programme, Adult Education Programme).

Stencils are to be permitted during the examination.

Recommended Books :

1. Ahmad, A. (2006). *Social Geography* (Reprint). Jaipur, India: Rawat.

2. Hamnett, C. (Ed.). (1996). *Social Geography : A Reader*. New York, NY: John Wiley & Sons.

3. Majid, H. (2006). *Human Geography* (3rd ed.). Jaipur, India: Rawat.

4. Mehtani, S. & Sinha, A. (2010). *Social Geography*. New Delhi, India: Commonwealth.

5. Mohanty, G. S. (Ed.). (2005). *Social & Cultural Geography*. Delhi, India: Isha Books.

6. दीक्षित, एस. एवं त्रिपाठी, आर. (2008). *सांस्कृतिक भूगोल*. गोरखपुर, भारत: वसुन्धरा.

7. मौर्य, एस. डी. (2010). *समाजिक भूगोल*. इलाहाबाद, भारत: शारदा पुस्तक भवन.

Suggested e-learning materials:

1. Society: Definition, origin and Classification, Society and Culture
   http://egyankosh.ac.in/bitstream/123456789/41246/1/Unit-1.pdf
2. Family welfare programmes
   https://humdo.nhp.gov.in/about/national-fp-programme/

Reading Electives

ENVS 512R Agroforestry

Max. Marks : 100	**L**	**T**	**P**	**C**
(ESA: 100)	**0**	**0**	**0**	**2**

Learning Outcomes:

After the completion of this course, students should be able to:

- Describe agroforestry and agroforestry interventions.
- Assess the role of Agroforestry as a sustainable land-use activity.
- Describe Nutrient cycling and role of agroforestry in soil and water conservation
- Describe various energy plantation methods.

Course Content:

Agroforestry - definition and scope. Tropical deforestation, rising demands of fuel wood, fodder and timber, social, ecological and economic reasons for agroforestry. Traditional agroforestry systems: shifting cultivation, taungya, homegardens. Recent trends in Silviculture and Energy plantations. Trees in agricultural fields and farm boundaries. Commercial crops under shade of planted trees as well as natural forests. Agroforestry for wasteland development and temperate agroforestry practices. Nutrient cycling and role of agroforestry in soil and water conservation. Nitrogen fixation, improvement in soil physico-chemical properties. Soil organic matter status and soil organic matter, Soil fertility considerations in agroforestry nutrient needs of trees and crops.

Recommended Books:

1. Chundawat, B. S., & Gautam, S. K. (2016). *Textbook of Agroforestry*. New Delhi, India: Oxford & Ibh.
2. Jose, S. (2009). *Agroforestry for Ecosystem Services and Environmental Benefits (Advances in Agroforestry)*. Dordrecht, Netherlands: Springer
3. Mukherjee, A. (2016). *Agroforestry and Watershed Management: An Interlocked System.* New Delhi, India: Random.
4. Raj, A. J. (2017). *Agroforestry Theory and Practices*. Jodhpur, India: Scientific.

Suggested e-learning materials:

1. Introductory Agroforestry
   http://ecoursesonline.iasri.res.in/course/view.php?id=157
2. Forestry Technologies
   http://agritech.tnau.ac.in/forestry/agroforestry_index.html

ENVS 513R Energy Resources and Conservation

Max. Marks : 100	**L**	**T**	**P**	**C**
(ESA: 100)	**0**	**0**	**0**	**2**

Learning Outcomes:

After the completion of this course, students should be able to:

- Describe the non-conventional sources of energy.
- Explain concepts on energy utilization and conservation.
- Emphasize energy conservation strategies in residential, industrial and transportation sector.
- Describe National Energy Policy.

Course Content:

Introduction: Energy, work and power. Classification of energy resources, An overview of the current global and National Energy Scenario. Fossil Fuels: Sources, exploration of oil, coal, natural gas, shale; Exploitation of Fossil fuels and their Environmental consequences. Nuclear Energy: Nuclear fission and Fusion; Nuclear fuel cycle, Nuclear reactor and nuclear power, Renewable and Alternative Energy Sources, Solar energy, solar power, Photovoltaic cells; Wind power; Geothermal energy; Ocean energy. Environmental consequences of biomass resource harnessing, Energy Conservation: National Energy Policy, Energy efficient appliances, BEE Label, Modes of Energy Conservation in residential, industrial and transportation sector.

Recommended Books:

1. Agarwal, S. K. (2003). *Nuclear Energy: Principles Practice and Prospects.* New Delhi, India: APH.

2. Chaturvedi, P. (1995). *Bio-Energy Resources.* New Delhi, India: Concept.

3. Dayal, M. (1997). *Renewable Energy: Environment and Development*. New Delhi, India: Konark.

4. Mahajan, V. S. (1991). *National Energy: policy, crisis and growth*. New Delhi, India: Ashish.

5. Markuszewski, R., & Blaustein, B. D. (1986). *Fossil fuels utilization. Environmental concerns*. Washington, DC: American Chemical Society.

6. Vandana, S. (2002). *Alternative Energy.* New Delhi, India: APH.

Suggested e-learning materials:

1. Biodiesel production
https://nptel.ac.in/courses/102105058/52

2. Sustainability through Green Manufacturing Systems: An Applied Approach
https://nptel.ac.in/courses/112104225/22

ENVS 515R Man and Environment

Max. Marks : 100	**L**	**T**	**P**	**C**
(ESA: 100)	**0**	**0**	**0**	**2**

Learning Outcomes:

After the completion of this course, students should be able to:

- Describe the complex interactions of humans and ecological systems in the natural world.
- Synthesize and apply a wide range of scientific literature in the ecological and environmental science.
- Interpret a wide range of scientific literature in ecology and environmental science.
- Apply the information in the realms of environmental sciences and sustainability.

Course Content:

Human Population, its Growth and Distribution, Environmental Deterioration associated with population growth, Man Induced Environmental Changes, Types of Human Activities, Impact of Human Activities such as Deforestation, Mining and Industrialization. Environmental Awareness- Need and Role in Betterment of Environment Concept and Significance of Environmental Movements, Environmental Movements in India with special reference to The Bishnoi Movement, Chipko Movement, Appiko Movement, Narmada Bachao Andolan, Silent Valley Movement. Components of natural and built environment: Resources and human settlements, modifications in natural environment, causes and consequences.

Recommended Books :

1. Bal Anand, S. (2005). *An Introductiion to Environmental Management*. Mumbai, India : Himalaya.
2. Chandana, R. (2008). *A Geography of population*. New Delhi, India: Kalyani.
3. Chopra, G. (2006). *Population Geography.* New Delhi, India: Commonwealth.
4. Chorley, R. J., Schumm, S. A., & Sugden, D. E. (1984). *Geomorphology*. London, UK: Methuen and Company.
5. Dayal, P. (1994). *A Text Book of Geomorphology*. New Delhi, India :Kalyani.
6. Rapoport, A. (2016). *Human aspects of urban form: towards a* m*an —environment approach to urban form and design*. Oxford, UK: Elsevier Pergamon Press.

Suggested e-learning materials:

1. Environment and Ecology

   https://nptel.ac.in/courses/122102006/

2. Ecological Degradation and Environmental Protection

   https://nptel.ac.in/courses/109104045/35#

ENVS_517R Water and Sustainable Development

Max. Marks : 100	**L**	**T**	**P**	**C**
(ESA: 100)	**0**	**0**	**0**	**2**

Learning Outcomes:

After the completion of this course, students should be able to:

- Classify major causes of exploitation of water resources, particularly in the Indian and Asian context.
- Summarize rainwater harvesting and water conservation measures.
- Describe methods of Irrigation management.
- Describe importance of Wetlands and its conservation

Course Content:

Water and sustainable development. Water and human health – Access to safe drinking water and sanitation; public health issues. Water and food production – Role of irrigation in food security. Shifts in cropping patterns, Rain-fed agriculture, increasing use of groundwater. Environmental, economic and social implications of exploitation of ground water resources. Water and human amenities – Urban water supplies; exploitation, conservation and rainwater harvesting. Wetland, its use and abuse with Ramsar Convention. Urban floods, storm water drainage and integrated urban water management (IUWM). Irrigation management – canals and micro-irrigation.

Recommended Books:

1. Asawa, G. L. (2005). *Irrigation and Water Resources Engineering*, New Delhi, India: New Age.
2. Biswas, A. K., Jellau, M., & Stout, G. (1993). *Water for sustainable development in 21st century – A Global perspective*, Oxford, UK: Oxford University Press.
3. David, L. F. (2007). *Water Policy for Sustainable Development*. Baltimore, Maryland: Johns Hopkins University Press.
4. Jain, S. K., & Singh, V. P. (2003). *Water Resources Systems Planning and Management*. Amsterdam, Netherlands: Elsevier.

Suggested e-learning materials:

1. Water, Society and Sustainability
   https://onlinecourses.nptel.ac.in/noc18_hs36/preview

2. Irrigation Efficiencies - II and Irrigation Methods and their Suitability
   https://nptel.ac.in/courses/105102159/15

GEOG 513R Environmental Challenges and Disaster Management

Max. Marks : 100	**L**	**T**	**P**	**C**
(ESA: 100)	**0**	**0**	**0**	**2**

Learning Outcomes:

After the completion of this course, students should be able to:

- Explain approaches to study environmental development and crisis.
- Describe world energy crisis with its causes and suggested measures for improvement.
- Describe several environmental problems their causes, consequences and mitigation.
- Depict the major disasters and their management with the help of case studies.

Course Content:

Environment:-Definition and types of Environment; Environmental Development Crisis:-Introduction and its causes; Energy Crisis:- Concept, Causes and Remedies; Environmental issues associated with Green Revolution; Impact of Urbanization on Environment.

Deforestation:- Concept, Causes, Effects and Conservation; Desertification:- Concept, Causes, Impacts and Preventions; Water Scarcity:- Causes ; Methods of Rain Water Harvesting (special reference to Traditional Methods); Acid Rain:- Causes, Consequences and Mitigation Measures; Solid Waste:- Introduction, Types and Management.

Disaster:- Definition and Classification; Natural Disaster:- Nature and Types; Flood:- Causes, Impacts and Methods of Management; Earthquake:- Introduction, Types, Causes, Effects and Mitigation; Case Studies:- Bhuj Earthquake-2001,Tsunami (Southern India)-2004 and Kedarnath Disaster-2013.

Stencils are to be permitted during the examination.

Recommended Books:

1. Gautam, A. (2010). *Environmental Geography*. Allahabad, India: Sharda Pustak Bhawan.
2. Ghosh, G. K. (2015). *Disaster Management*. New Delhi, India: A.P.H.
3. Singh, S. (2002). *Physical Geography*. Gorakhpur, India: Vasundhara.

Suggested e-learning materials:

1. Deforestation:- Concept, Causes, Effects

   https://www.livescience. com/27692-deforestation.html

2. Acid Rain:- Causes, Consequences and mitigation measures https://www.conserve-energy-future.com/causes-and-effects-of-acid-rain.php

3. Solid Waste:- Introduction, Types and Management

   https://www. indiawaterportal.org/topics/solid-waste

GEOG 514R India: Socio-Political and Environmental Scenario

Max. Marks : 100	**L**	**T**	**P**	**C**
(ESA: 100)	**0**	**0**	**0**	**2**

Learning Outcomes:

After the completion of this course, students should be able to:

- Understand the current issues related with boundaries. water sharing, agricultural disparities, food security in India.

- Describe problems in Agricultural Development.
- Discuss Gender Issues and Women Safety.
- Find the role of non – conventional energy resources for solving energy crisis.

Course Content:

Relation of India with neighbouring countries and border disputes with China and Pakistan. Drought problems, Interlinking of rivers as a solution of water crises and disputes of river water sharing with reference to Narmada, Krishna, Cauvery and Sutlej Yamuna Link (SYL). Problems and disparities in agricultural development, food security and farmer suicides in India. Energy crisis in India and its solution with the help of nuclear, solar, hydro and wind power. Gender issues and women safety, poverty and unemployment.

Recommended Books :

1. Deshpande, C. D. (1992*). India, A Regional Interpretation*. New Delhi, India: ICSSR & Northern Book Centre.
2. Gallaher, C. et al. (2012). *Key Concepts in Political Geography* (Reprint). New Delhi, India: Sage.
3. Hussain, A. (2007). *Political Geography.* New Delhi, India: Vishvabharti.
4. Singh, R. L. (Ed.).(1971). *India - A Regional Geography*. Varanasi, India: National Geographical Society.
5. Tirtha, R., & Gopal, K. (1996). *Emerging India.* Jaipur. India: Rawat.
6. बंसल, एस. सी. (2011). *भारत का भूगोल.* मेरठ, भारत: मीनाक्षी.

Suggested e-learning materials:

1. Interlinking of rivers
   https://www.geoecomar.ro/website/publicatii/Nr.19 2013/12_mehta_web_2013.pdf
2. Farmer suicides

   http://www.ipcinfo.org/fileadmin/user_upload/ fsn/docs/Agriculture%20and%20rural%20development%20in%20India.pdf

3. Food Security
https://dfpd.nic.in/LwB3AHIAaQB0AGUAcgBlAGEAZABkAGEAdABhAC8AUABvAHIAdABhAGwALwBNAGEAZwBhAHoAaQBuAGUALwBEAG8AYwB1AG0AZQBuAHQALwA=1_93_1_Original.pdf

4. Gender Issues in India
https://www.indiacelebrating.com/social-issues/gender-inequality-in-india/

GEOG 515R Rajasthan: Challenges and Prospects

Max. Marks : 100	**L**	**T**	**P**	**C**
(ESA: 100)	**0**	**0**	**0**	**2**

Learning Outcomes:

After the completion of this course, students should be able to:

- Describe the major environmental, socio economic problems of Rajasthan.
- Explain desertification, Aravalli development, agriculture and tourism of Rajasthan.
- Analyze existing state and national policies in terms of socio economic conditions.
- Aware society regarding existing policies related to child marriage, Female feticide and other Social problems.

Course Content:

Major Canal Irrigation Project and Its impact; Desertification and Desert Development programmes; Identification of drought prone areas and mitigation, problem of mining and Aravalli Development Programme, Problems and measures of Agricultural development; Programmes for forest conservation; Poultry farming, Planning for livestock development; Role of Tourism in the economy.

Socio- economic issues and Government policies and programmes: child marriage, female feticide, female education, gender discrimination and caste; unemployment and poverty.

Recommended Books :

1. Singh, G. (2010). *Geography of India* (9th ed.). Delhi, India: Atma Ram.

2. शर्मा, आर. (2010). *राजस्थान का भूगोल.* उदयपुर, भारत: हिमाशुं.

3. शर्मा एच. एस., एवं शर्मा, एम. एल. (2015). *राजस्थान का भूगोल.* जयपुर, भारत: पचंशील.

4. सक्सैना, एच. (2014). *राजस्थान का भूगोल.* जयपुर, भारत: राजस्थान हिन्दी ग्रंथ अकादमी.

Suggested e-learning materials:

1. Indira Gandhi Canal

   https://www.rajras.in/index.php/indira-gandhi-canal/

2. Tourist spots in Rajasthan

   http://www.transindiatravels.com/rajasthan/tourist-places-to-visit-in-rajasthan/

3. Problem of Desertification

   http://www.cazri.res.in/annals/1993/1993JA-1.pdf.

GEOG 517R Transforming India

Max. Marks : 100	**L**	**T**	**P**	**C**
(ESA: 100)	**0**	**0**	**0**	**2**

Learning Outcomes:

After the completion of this course, students should be able to:

- Assess the ongoing governmental policies applicable to socio-economic and health sectors.

- Aware society about the injustice caused to Women in terms of Triple Talaq.
- Explain current livelihood struggle in the society and the role of skill development in enhancing quality of life.
- Suggest the measures of improvement in the policies.

Course Content:

Transforming India into a digitally empowered society and development through digitalization, its effects and problems. Demonetization- a step to less cash to cash less economy. Indian youth as a change agent and quality of education for empowering Indian youth, Skill development and empowering youth, Population pressure in job sector and creating livelihood opportunities. Swachh Bharat Mission and Sanitation revolution for clean and healthy society, Ayushman Bharat Yojana- a step towards Health for all. Beti Bachao Beti Padhao- a step for girl's development and Triple Talaq in India- an injustice for women or religious issue.

Recommended Books :

1. Ghosh, J., Chandrashekra, C. P., & Patnaik, P. (2017). *Demonetisation Decoded*. New York, NY: Routledge.
2. Panigrahi, R. L. (2005*). Population problems in India*. New Delhi, India: DPH.
3. Sinha, M., & Sinha, R. K.(Ed). (2008). *Swachh Bharat, A clean India*. New Delhi, India: Prabhat.

Suggested e-learning materials:

1. Transforming India
   http://transformingindia.in/
2. Digital India
   https://www.indianeconomy.net/splclassroom/what-is-digital-india/
3. Demonetization
   http://www.mbauniverse.com/group-discussion/topic/business-economy/demonetisation
4. Skill Development in India
   https://www.indiainfoline. com/article/ article-latest/skill development -in-india-gaps-and-opportunities 118092700366_1.html

5. Swachh Bharat Mission
https://www.mapsofindia.com/my-india/society/swachh-bharat-abhiyan-making-india-clean-more

6. Beti bachao and Beti Padhao
http://www.mbauniverse.com/group-discussion/topic/socialissues/beti-bachao-beti-padhao

GEOL 514R Geo Tourism

Max. Marks : 100	**L**	**T**	**P**	**C**
(ESA: 100)	**0**	**0**	**0**	**2**

Learning Outcomes:

After the completion of this course, students should be able to:

- Elucidate the criterion require for designating geotour sites.
- Explore the geological and geographical attributes of the geosites.
- Develop a geo-conservation plan for geotour sites.
- Evaluate the potential of geosites for revenue generation.

Course Content:

Definition and scope of Geotourism. Principles of Geotourism. Geoconservation Plans. Introduction to geodiversity and Geopark. UNESCO's Global Geopark development program. Overview of GSI monuments and geotour sites-Sendra Granite of Pali District Rajasthan. Lonar Lake of Buldana District Maharastra, Peninsular Gneiss at Lalbagh Bangalore Karnatakam, Natural Arch in Tirumala hills Chitoor District, Barr Conglomerate Pali District Rajasthan, Marine Gondwana Fossil Park, Fossil Wood Parks, Siwalik Fossil Park, Stromatolite Parks, Columnar Basalt, Pillow Lava, Pyroclastic Rocks, Nepheline Syenite, Welded Tuff, Charnockite, Great Boundary Fault, Eparchaean Unconformity, Tirumala hills. World's major geotour sites.

Recommended Books :

1. Chen, A. (2015). *The Principles of Geotourism.* Beijing, China: Springer-Verlag.

2. Dowling, R., & Newsome, D. (Eds.). (2018). *Handbook of Geotourism.* Gloucestershire, UK: Edward Elgar.

3. Dowling, R., & Newsome, D. (Eds.). (2005). *Geotourism*. Oxford, UK: Elsevier.

4. Newsome, D., & Dowling, R. (Eds.). (2010). *GEOTOURISM: The Tourism of Geology and Landscape*. Oxford, UK: Goodfellow.

Suggested e-learning materials

1. UNESCO geological heritage and geo-tourism in Peru
http://www.unesco.org/new/en/media-services/single view/news/unesco_geoparks_geological_heritage_and_geo_tourism_in_peru/

2. Geotourism
https://link.springer.com/referenceworkentry/10.1007%2F978-3-319-01669-6_93-1

3. Geotourism in India
https://www.gsi.gov.in

GEOL 517R Indian Mineral Deposits, Economics and Mining Ethics

Max. Marks : 100	**L**	**T**	**P**	**C**
(ESA: 100)	**0**	**0**	**0**	**2**

Learning Outcomes:

After the completion of this course, students should be able to:

- Explain the distribution of mineral resources in India.
- Evaluate the mineral resources and reserves in Indian and global perspective.
- Familiarize with the concept of mineral legislation and policies.
- Delineate the different environmental issues associated with mining activities.

Course Content:

Introduction to types and distribution of various mineral deposits in India. Occurrences of important metallic, non-metallic/industrial and fuel mineral deposits of India. Mineral economics and its major concept. Introduction for Global mineral resources. Conservation and substitution of minerals;

changing pattern of mineral consumption, Growth of mineral industry and economy, Mineral industry and its adverse effect to the environment. Environmental baseline data needed for mine planning-Its acquisition and documentation during different stages of exploration. Nature and extent of environmental problems due to surface and underground mining. Legislation and control measures for mining. Mineral legislation in Indian context (The Mines and Minerals Regulation and Development Act, 1957). Reclamation and restoration of mined land.

Recommended Books :

1. Arogyaswamy, R. N. P. (1995). *Courses in Mining Geology* (4th ed.). New Delhi, India: Oxford and IBH.
2. Banerjee, D. K. (1998). *Mineral Resources of India* (2nd ed.). Kolkata, India: The World Press.
3. Chatterjee, K. K. (1993). *An Introduction to Mineral Economics* (2nd ed.). Bangalore, India: New Age International.
4. Sharma, N. L., & Ram, K. S. V. (1964). *Introduction to India's economic minerals*. Dhanbad, India: Dhanbad.
5. Sinha, R. K., & Sharma, N. L. (1988). *Mineral Economics* (4th ed.). New Delhi, India: Oxford & IBH.

Suggested e-learning materials:

1. Mineral and energy resources

   http://ncert.nic.in/ncerts/l/ legy207.pdf

2. Economic Minerals of India
   https://www.researchgate.net/
   publication/315831629_Economic_Minerals_of_India

GEOL 518R Innovation and Entrepreneurship in Earth Sciences

Max. Marks : 100	**L**	**T**	**P**	**C**
(ESA: 100)	**0**	**0**	**0**	**2**

Learning Outcomes:

After the completion of this course, students should be able to:

- Understand necessary steps to open a new venture.

- Gain an understanding of creating products or services, launching innovative projects and making R&D investments in a start-up context.
- Develop marketing strategies for tools and technical products used in earth sciences.
- Familiarize with the legal concepts and financial planning for a successful new venture.

Course Content:

An overview of Entrepreneurs and Entrepreneurship. Evolution and Growth of Earth Science. Entrepreneurship in India, Starting small business. Planning-Organization and Management. Basic layout of Proposal for seeking loan from financial institution, Legal requirements, Basic Financial Planning and problems. Case study of successful Earth Science Entrepreneurs in India Earth Science component in Government of India PSU (MECL, NHPC Mini Ratna, ONGC, NTPC, CIL Maharatna) and in MNC (Larsen and Toubro, Tata, Reliance, Vedanta, Dalmiya groups, Aditya Birla). Entrepreneurs Skills and Competencies. Earth Science technology for harnessing Innovation. Challenges of new startups, Marketing Strategies development, Tools and techniques for market Assessments, Methods and sources for market survey and Market Information. Presentation of Market Survey Report.

Recommended Books :

1. Clarysse, B. (2011). *The Smart Entrepreneur: How to Build for a Successful Business*. London, UK: Elliott & Thompson.
2. Sethi, A. (2016). *From Science to Startup: The Inside Track of Technology. Entrepreneurship*. Göttingen, Germany: Copernicus & Springer.
3. Westhead, P., & Wright, M.(2013). *Entrepreneurship. A very short introduction*. Oxford, UK: Oxford University Press.

Suggested e-learning materials:

1. Sustainability, Innovation and Entrepreneurship
   https://nptel.ac.in/courses/110107094/26
2. New Enterprises
   https://ocw.mit.edu/courses/sloan-school-of-management/15-390-new-enterprises-spr

GEOL 521R Natural Hazards and Disasters

Max. Marks : 100	**L**	**T**	**P**	**C**
(ESA: 100)	**0**	**0**	**0**	**2**

Learning Outcomes:

After the completion of this course, students should be able to:

- Explain the key concepts, definitions, perspectives of all hazards and management.
- Describe prevention and mitigation of natural hazards.
- Depict the preparedness response and recovery management of natural disasters.
- Elucidate the sustainable development methods in disaster mitigation.

Course Content:

Introduction to Disasters and Hazards, Processes (Internal and External), Types of Hazards: causes and consequences, Prediction and Indicators of Natural Disasters, Socio-economic and Health impacts of Natural Disasters.

Natural Disasters – Earthquake: Processes, Magnitude, Intensity and Impact. Volcanism: Types, Risks and Impact.Tsunami and Cyclone: Types, Causes, processes and Impact. Floods: Introduction, Magnitude, Frequency, Zonation and Impact. Mass Wasting: Classification, causes and Impact. Disaster Management: Prevention, Preparedness and Mitigation, Planning and control of Natural Disaster. Case Studies: Nepal Earthquake, Kedarnath Disaster, Bhuj Earthquake 2001.

Recommended Books:

1. Bolt, B. A. (1988). *Earthquakes.* New York, NY: WH Freeman & Company.
2. Decker, R. W. & Decker, B. B. (2005). *Volcanoes* (4th ed.). New York, NY: WH Freeman & Company.
3. Dowrick, D. (2003). *Earthquake Risk Reduction Zone.* England, UK: John Wiley & Sons.

4. Gere, J. M., & Shah, H. C. (1984). *Terra Non Firme Understanding and Preparing for Earthquakes.* New York, NY: WH Freeman & Company.

5. IGNOU (2005). *Understanding Natural Disasters*. e Gyan Kosh, Noida, India: Shagun Offset Press.

6. Keller, E. A., & Devecchio, E. D. (2015). Natural Hazards (4th ed.). New York, NY: Pearson.

7. Keller, E.A. (1978). *Environmental Geology* (9th ed.). North Carolina, NC : Bell & Howell.

8. Montgomery, C.W. (2013). *Environmental Geology* (10th ed.). New York, NY : McGraw Hill.

9. Prakash, I. (1994). *Disaster Management*. Ghaziabad, India: Rastriya Prahari.

10. Sharma, V. K. (1995). *Disaster Management*. New Delhi, India: Indian Institute of Public Administration (*IIPA*).

11. Singh, S. (2015). *Environmental Geography*. Allahabad, India: Pravalika.

Suggested e-learning materials:

1. Introduction to Natural hazards
   https://epgp.inflibnet.ac.in/ahl.php?csrno=17
   https://onlinecourses.nptel.ac.in/noc19_ce14/preview

2. Disasters and Hazards
   https://ndma.gov.in/en/

List of Online Reading Electives				
S. No.	Agency/ Portal	Name of course	Credit point(s)	URL
1	Indian Institute of Technology Madras, NPTEL	Non-Conventional Energy Resources	2	https://onlinecourses. nptel.ac.in/noc18 _ge 09/preview
2	Indian Institute of Technology Roorkee, NPTEL	Mineral Resources: Geology, Exploration, Economics and Environment	2	https://onlinecourses. nptel.ac.in/noc18 _ ce13/preview
3	Indian Institute of Technology Kanpur, NPTEL	Natural Hazards Part 1	2	https://onlinecourses. nptel.ac.in/noc19 _