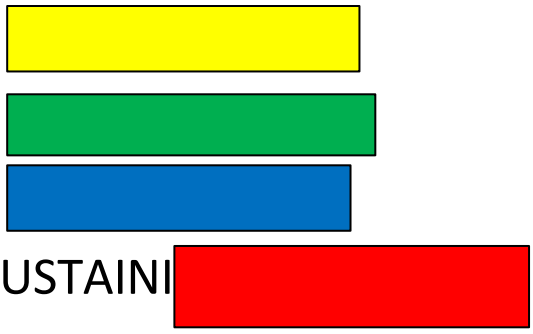
CRITERIA 1.1.3

Different UG And PG Programme, Sample of Courses With Highlight On Ethics / Gender / Human Values / Environment And Sustainability Aspects Is Presented.

Programme: M.A GEOGRAPHY

1. ETHICS
2. GENDER
3. HUMAN VALUES
4. ENVIRONMENT AND SUSTAINI



Netaji Subhas University

Pokhari, Bhilai Pahari, Jamshedpur

M.A GEOGRAPHY

POST GRADUATE PROGRAMME

DEPARTMENT OF GEOGRAPHY

PO,PSO &CO WITH THE DETAILED SYLLABUS

INCLUSION OF PO, PSO & CO IN SYLLABUS

P.G.SYLLABUS

Post Graduate Programme in Geography

Netaji Subhas University

Pokhari, Jamshedpur

Effective from Academic Session 2019-2022

Head
Department of Geography
Netaji Subhas University

NETAJI SUBHAS UNIVERSITY
JAMSHEDPUR

Dean Academics
Netaji Subhas University
Jamshedpur, Jharkhand

Post graduate M.A. (Hons.) Geography

PROGRAM OUTCOMES

The programme outcomes are attained by the postgraduate students of Netaji Subhas University through learning acquired on completion of a programme of study. Individual programmes of study has a defined programme specific learning outcomes which needs to be attained for the award of a specific degree. The programme learning outcomes of Netaji Subhas University focus on various aspects of knowledge and skills that prepare students for further study, employment, and citizenship. Therefore, the PG programme of the Netaji Subhas University has been designed with the objective to develop in-depth knowledge of students in frontier areas of concerned subject and seeks to achieve the following:

PO1: Critical Thinking: Students will have the capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, and beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development

PO2: Effective Communication: Students will acquire the ability to express thoughts and ideas effectively in writing and orally in English and regional and make meaningful interpretation by people, ideas, books, media and technology.

PO3: Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings.

PO4:Effective Citizenship: Demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

PO5:Values and Ethics: Recognize different value systems including own, understand them oral dimensions of different decisions, and accept responsibility for them.

PO6: Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

PO7: Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context of socio-technological changes.

PROGRAMME SPECIFIC LEARNING OUTCOME (PSO)

The programme learning outcomes relating to M.A. Programme in geography:

PSO1: Demonstrating the understanding of basic concepts in geography and systematically geographical knowledge and understanding the theoretical as well as practical applications with understanding of various aspects.

PSO2: Exhibit the skill in using geographical research tools including spatial statistics, cartography, remote sensing, GIS, IRNSS and GIS-Science.

PSO3: Display an ability to read and understand maps and topographic sheets to look at the various aspects on the space.

PSO4: Cultivate ability to evaluate critically the wider chain of network of spatial aspects from global to local level on various time scales as well.

PSO5: Recognize the skill development in Geographical studies programme as part of career avenues in various fields like teaching, research and administration.

PSO6: Understand the relevance of geographical knowledge to every day life and the ability to understand the significance of geographical aspects in relation to development of the regions and minimizing regional inequalities.

PSO7: Getting the ability to communicate geographic information utilizing both lecture and practical exercises.

PSO8: Inculcate the ability to evaluate geographical problems effectively. It is also suggested that after the completion of M.A. Programme, students should be able to demonstrate the knowledge obtained in such way so that they can explore the employability options and service to the society through the theoretical and practical means for realising the Sustainable Development Goals (SDG) both in rural and urban spaces.

Semester-wise Course Structure and Module Composition.

Semester	Papers	No. of Modules	Credit	Marks	Total Marks
Semester-I	Theory	3	15	300	**400**
	Practical	1	5	100	
Semester-II	Theory	3	15	300	**400**
	Practical	1	5	100	
Semester-III	Theory	3	15	300	**400**
	Practical	1	5	100	
Semester-IV	Theory	2	10	200	**400**
	Practical	2	10	200	
Total	**Theory**	**11**	**55**	**1100**	**1600**
	Practical	**5**	**25**	**500**	

List of Core Papers

SEM	CORE PAPER CODE	NAMEOFTHECORE PAPERS
I	CC-101	GEOMORPHOLOGY
	CC-102	ECONOMICGEOGRAPHY
	CC-103	REGIONALGEOGRAPHYOFINDIA
	CC-104	REMOTESENSINGAND GIS
II	CC-201	CONCEPTUALDEVELOPMENTIN GEOGRAPHY
	CC-202	RESEARCHMETHODOLOGYAND SURVEYTECHNIQUES
	CC-203	GEOGRAPHYOFSETTLEMENTS
	CC-204	REGIONALGEOGRAPHYOF JHARKHAND
III	CC-301	ENVIRONMENTALGEOGRAPHY
	CC-302	OCEANOGRAPHY
	CC-303	HYDROLOGYANDWATER RESOURCESMANAGEMENT
	CC-304	STATISTICALMETHODSIN GEOGRAPHY
IV	CC-401	NATURALHAZARDS&DISASTER MANAGEMENT
	CC-404	DISSERTATION

List of Elective Papers

Sem	Code	Groups	Papers
IV	EC 402	A	TROPICAL METEOROLOGYAND CLIMATOLOGY
	EC 403		CLIMATECHANGEAND ITS IMPACTS
	EC 402	B	GISANDITSAPPLICATION
	EC 403		AERIALPHOTOGRAPHY, REMOTESENSING,GPS AND GIS

Semester-I

S. No	Subject Code	Subject	Credit				Examination Marks Detail			
			L	T	P	Total	External Exam	Internal Exam	Practical	Total
1	CC-101	Geomorphology	4	1	0	5	70	30	-	100
2	CC-102	Economic Geography	4	1	0	5	70	30	-	100
3	CC-103	Regional Geography Of India	4	1	0	5	70	30	-	100
4	CC-104	Remote Sensing And GIS	2	1	2	5	50	30	20	100
Total			14	4	2	20				400

Semester-II

S. No	Subject Code	Subject	Credit				Examination Marks Detail			
			L	T	P	Total	External Exam	Internal Exam	Practical	Total
1	CC-201	Conceptual Development In Geography	4	1	0	5	70	30	-	100
2	CC-202	Research Methodology And Survey Techniques	3	1	1	5	50	30	20	100
3	CC-203	Geography Of Settlements	4	1	0	5	70	30	-	100
4	CC-204	Regional Geography Of Jharkhand	4	1	0	5	70	30	-	100
Total			15	4	1	20				400

Semester-III

S. No	Subject Code	Subject	Credit				Examination Marks Detail			
			L	T	P	Total	External Exam	Internal Exam	Practical	Total
1	CC-301	Environmental Geography	4	1	0	5	70	30	-	100
2	CC-302	Oceanography	4	1	0	5	70	30	-	100
3	CC-303	Hydrology And Water Resources Management	4	1	0	5	70	30	-	100
4	CC-304	Statistical Methods In Geography	2	1	2	5	50	30	20	100
Total			14	4	2	20				400

Semester-IV

S. No	Subject Code	Subject		Credit				Examination Marks Detail			
				L	T	P	Total	External Exam	Internal Exam	Practical	Total
1	CC-401	Natural Hazards & Disaster Management		4	1	0	5	70	30	-	100
2	CC-402	Group A	Tropical Meteorology And Climatology	4	1	0	5	70	30	-	100
		Group B	GIS and Its Application	2	1	2	5	50	30	20	100
3	CC-403	Group A	Climate Change And Its Impacts	4	1	0	5	70	30	-	100
		Group B	Aerial Photography, Remote Sensing, GPS And GIS	2	1	2	5	50	30	20	100
4	CC-404	Dissertation		0		5	5	-	-	100	100
Total											400

M. A. Geography

Semester-1(400 Marks, 20 credits)

GEOMORPHOLOGY (100 Marks-5Credits)
Core Course-CC-101

Course Objective:

This course provides students with an understanding of the relationship between landscape forms and the geomorphic processes that shape them, and critically evaluate and connect information about geomorphic processes

Course Outcome:

CO101.1 Understand the functioning of Earth systems in real time and analyse how the natural and anthropogenic operating factors affects the development of landforms.
CO101.2 Distinguish between the mechanisms that control these processes.
CO101.3 Assess the roles of structure, stage and time in shaping the landforms, interpret geomorphological maps and apply the knowledge in geographical research.
CO101.4 Monitoring change of different landforms.

Course Contents:

Unit-I: Nature and scope of Geomorphology, Fundamental concepts—Geological structures and Landforms, uniformitarianism, multicyclic and polygenetic evolution of landscapes, concept of threshold, Environmental change — climatic change and geochronological methods- documentary evidence.

Unit -II: Earth movements - epeirogenic, orogenic and cymatogenic earth movements. Forces of crustal instability, isostasy, plate tectonics, seismicity, vulcanicity, orogenic structures with reference to the evolution of the Himalaya.

Unit-III : Exogenic Processes: Concept of gradation, Agents and processes of gradation, causes, types and classification of weathering, mass movement erosional, and depositional processes and resultant and forms and soil formation. Slope evolution, down wearing, parallel retreat and slope replacement models.

Unit-IV : Geomorphic processes: dynamics of fluvial, glacial, Aeolian, marine, and karst processes and resulting landforms' complexities in geomorphological processes, Erosion surfaces— techniques of identification and correlation.

Unit-V: Applied geomorphology—application of geomorphic mapping terrain evaluation. Digital Elevation Model (DEM)and Triangulated Irregular Network (TIN)unit, land capability and land suitability classification, hydro-geomorphology, urban geomorphology, environmental geomorphology, geomorphic hazards.

Suggested Readings

1. Chorley, R .J.: Spatial Analysis in Geomorphology, Methuen, London,1972.
2. Cooke, R.U. and Doornkamp, J.C.: Geomorphology in Environmental Management—A introduction, Clarendon Press, Oxford, 1974.
3. Dury, G.H.: The Face of the Earth, Penguin Harmondsworth, 1959.
4. Fairbridge, R.W. Encyclopedia of Geomorphology, Reinholdts,NewYork,1968.
5. Goudie, A.: The Nature of the Environment, Oxford & amp; Blackwell, London,1993.
6. Garner, H.F.: The Origin of land scape—A Synthesis of Geomorphology, Oxford University Press, London, 1974.
7. Mitchell, C.W.: Terrain Evaluation, Longman, London,1973.
8. Ollier, C. D .: Weathering, Longman, London,1979.
9. Pitty, A. F. Introduction to Geomorphology, Methuen, London,1971.
10. Stoddart, D. R.(ed.): Process and Formin Geomorphology, Routledge, NewYork,1996.
11. Skinner, B. J. & amp; Porter, S. C. : The Dynamic Earth John Wiley, New York, 1995.

12. Sparks, B.W. Geomorphology, Longman,London,1960.
13. Sharma, H .S .(ed.): Perspectives in Geomorphology, Concept, New Delhi,1980.
14. Singh, S.: Geomorphology, Prayag Publication, Allahabad, 1998.
15. Thornbury, W. D. Principles of Geomorphology, John Wiley,NewYork,1960.

Paper Name	Course Outcome	Critical Thinking:	Effective Communication:	Social Interaction:	Effective Citizenship:	Values and Ethics:	Environment and Sustainability:	Self-directed and Life-long Learning:
		P01	P02	P03	P04	P05	P07	P08
GEOMORPHOLOGY	CO101.1	1	3		3	3	3	3
	CO101.2	3	3		3	3	3	3
	CO101.3	3	3	2	3	3	3	3
	CO101.4	3	3	3	3	3	3	3
	Average	2.5	3	1.25	3	3	3	3

ECONOMICG EOGRAPHY (100 Marks-5 Credits)
Core Course-CC-102

Course Objective:

To understand the concept and spatial distribution of economic activities in the world and to analyze the theories. Impact of the green revolution on the national and global levels.

Course Outcome:
CO102.1 Acquainted with various dimension of economic geography.
CO102.2 Understand resource geography, agricultural geography, industrial geography and transport geography.
CO102.3 Analyze theory and find relation with recent area.
CO102.4 Monitoring green revolution and globalization in India and globally .

Course Contents:

Unit-I: Scope, content and recent trends in economic geography, relation of economic geography with economics and other branches of social sciences, Location of economic activities and spatial organization of economics, Classification of economies; sectors of economy(primary, secondary and tertiary).

Unit-II: Factors of location of economic activities: physical, social, economic and cultural; Concept and techniques of delimitation of agricultural regions, crop combination and diversification-Von Thunen's model and its modifications.

Unit-III : Classification of industries; Resource based and footloose industries, Theories of industrial location-Weber, Losch and Isard; Case studies of selected industries Iron and Steel, Aluminum, Chemical, Oil refining and Petrochemical, Engineering, Textile etc.

Unit - IV : Modes of transportation and transport cost; accessibility and connectivity: international, inter and intraregional; comparative cost advantages. Typology of markets, market network in rural

societies, market system in urban economy, role of market in the development of trade and commerce.

Unit-V: Economic development of India, Regional disparities, Impact of green revolution on Indian economy, Globalization and Indian economy and its impact on environment.

Suggested Readings

1. Berry J. L. Geography of Market Centres and Retail Distribution, Prentice Hall, New York, 1967.
2. Chatterjee, S. P.: Economic Geography of Asia, Allied Book Agency, Calcutta, 1984.
3. Chorley, R. J. and Haggett, P.(ed.):Network Analysis in Geography, Arnold,1969.
4. Dreze, J.and Sen, A.: India-Economic Development and Social Opportunity, Oxford University Press, New Delhi, 1996.
5. Eckarsley, R.(ed.):Markets, the State and the Environment, Mc Millan, London,1995.
6. Garnier .B.J. and Delobez, A Geography of Marketing, Longman,London,1979.
7. Hamilton, F.E.I.: Spatial Perspectives on Industrial Organisation and Decision Making, John Wiley, New York 1974.
8. Hamilton ,I.(ed.):Resources and Industry, Oxford University Press, NewYork,1992.
9. Hurst E: Transport Geography-Comments and Readings, McGraw Hill, New York 1974.
10. Morgan, WB and Munton R.J.C.: Agricultural Geography ,Methuen ,London,1977.
11. Pachuri, R. K. Energy and Economic Development in India, Praeger, New York 1977.
12. Robertson, D.(ed.):Globalization and Environment, E. Elgar Co.,U.K.,2001.
13. Rostow, W. W.: The Stages of Economic Growth, Cambridge University Press, London, 1960.
14Singh J. and Dhillon. S. S. Agricultural Geography, Mc Graw Hill, India, New Delhi 1984.
15. Symons. L: Agricultural Geography, Bell and Sons, London,1972.
16. Wheeler, J. e t. al.: Economic Geography, John Wiley, New York, 1995.

Paper Name	Course Outcome	Critical Thinking:	Effective Communication:	Social Interaction:	Effective Citizenship:	Values and Ethics:	Environment and Sustainability:	Self-directed and Life-long Learning:
		P01	P02	P03	P04	P05	P07	P08
ECONOMIC GEOGRAPHY	CO102.1	2	2	3	3	3	3	3
	CO102.2	1	2	2	3		3	3
	CO102.3	3	3	2	3	3	3	3
	CO102.4	3	3	3	3	3	3	3
	Average	2.2	2.5	2.5	3	2.25	3	3

REGIONAL GEOGRAPHY OF INDIA(100Marks-5Credits)
Core Course CC-103
Course Objective:
To focus on various dimensions of the geographical features of India and their spatial distribution. Understanding of the regional divisions of India. and detailed analysis of the economic resources of India

Course Outcome:
CO103.1 Understand the physical profile of the country.
CO103.2 Study the resource endowment and its spatial distribution and utilization for sustainable development.
CO103.3 Synthesise and develop the idea of regional dimensions.
CO103.4 Evaluate the different policies and programs for the regional development.

Course Contents:
Unit-I: Basis of regionalization: geo-political, climatic, agro-climatic, physiographic, historical, demographic, socio-economic dimensions of regionalization, case studies.

Unit-II: Macro-Regions: Genesis and changing profile; Indian federalism: a synoptic view; natural and human resources and resource utilization; Population-development environment interface Policies and Programmes.

Unit-III: Meso-Regions: bases of regionalization, physical and human resources; economic and inter linkages; population-development environment interface; Policies & Programmes.

Unit-IV : Micro- Regions: bases of regionalization; physical, human and economic resources; formal and functional linkages; Population-development, environment nexus; policies and programmes.

Unit-IV: Case-studies of Meso/ Micro level regions in detail (one from each of the divisions):
1. Natural/ Physical: like Sundarbans Delta, Indo-gangetic plain, Coastal India.
2. Political: New States of India:(Jharkhand, Uttaranchal, Chhatisgarh; Union territories;
3. Urban/ Metropolitan Regions: Delhi Metropolitan Region, Calcutta Metropolitan Region.
4. Cultural Regions: Bundelkhand

Note: These regions are only by way of a few examples. The regions may be selected on the basis of the expertise available with the Departments/Universities. The study should relate to natural and human resources their viability and stability inter-regional relations, development problems and prospects; polices and programmes.

Unit - V: Regions and regional development, Environmental issues in regional development and planning.

Suggested Readings
1. Centre for Science and ;Environment (1988) State of India's, Environment, NewDelhi.
2. Deshpande C. D India: a Regional Interpretation ICSSR & amp; Northern Book Centre.1992.
3. Dreze, Jean and; Amartya Sen(ed.)India Economic Development and Social opportunity :Oxford University Press, NewDelhi, 1996.
4. Kundu A. Raza Moonis: Indian Economy: the Regional Dimension. Spectrum Publishers, New Delhi, 1982.
5. Robinson, Francis: The Cambridge Encyclopaedia of India, Pakistan, Bangladesh, SriLanka, Nepal, Bhutan & amp; Maldives. Cambridge University Press, London, 1989.
6. Singh R.L.(ed.):India-A Regional Geography. National Geographical Society, India, Varanasi,1971.
7. Spate O H K and; ATA Lear month-India and; Pakistan Methuen, London.1967.
8. Tirtha R.& amp; Gopal Krishna, Emerging India Reprinted by Rawat Publications, Jaipur, 1996.

Paper Name	Course Outcome	Critical Thinking:	Effective Communication:	Social Interaction:	Effective Citizenship:	Values and Ethics:	Environment and Sustainability:	Self-directed and Life-long Learning:
		P01	P02	P03	P04	P05	P07	P08
REGIONAL GEOGRAPHY OF INDIA	CO103.1		2		2	2	3	3
	CO103.2	3	3	3	3	3	3	3
	CO103.3	3	1	3	3	3	3	3
	CO103.4	3	1	2	2	1	3	3
	Average	2.25	1.75	2	2.5	2.25	3	3

REMOTE SENSING AND GIS (100 Marks-5 Credits)
Core Course C C-104
Course Objective

The course aim is to give basic technical knowledge and practical experience in digital remote sensing and practical experience in handling satellite images, focusing on hands-on experience of image pre-processing, enhancement and classification Better understand the techniques for the study of land use land cover and urban study.

Course Outcome:
CO104.1 To learn the basics of remote sensing and GIS.
CO104.2 To apply the basic concepts and practice of the course for their interest.
CO104.3 To analyze land use land cover with the help of GIS
CO104.4 To evaluate different type of data and interpret satellite image
CO104.5 To create map using different type of data

Course Contents:
Unit-I: Remote Sensing and GIS: Definition and Components, Development, Platforms and Types.

Unit-I I: Aerial Photography and Satellite Remote Sensing: Principles, Types and Geometry of Aerial Photograph; Principles of Remote Sensing, EMR Interaction with Atmosphere and Earth Surface; Satellites (Landsat and IRS) and Sensors.

Unit-III: GIS Data Structures: Types (spatial and Non-spatial), Raster and Vector Data Structure

Unit - IV : Image Processing (Digital and Manual) and Data Analysis: Pre-processing (Radiometric and Geometric Correction), Enhancement (Filtering); Classification (Supervised and Un-supervised), Geo-Referencing; Editing and Output; Overlays.

Unit-V: Interpretation and Application of Remote Sensing and GIS: Land use/Land Cover, Urban Sprawl Analysis; Forests Monitoring.

Reading List

1. Bhatta,B.(2010) Analysis of Urban Growth and Sprawl from Remote Sensing, Springer, Berlin Heidelberg.41
2. Burrough, P.A., and McDonnell, R.A.(2000) Principles of Geographical InformationSystem-Spatial Information System and Geo-statistics. Oxford University Press
3. Chauniyal, D.D.(2010) Sudur Samvedanevam Bhogolik Suchana Pranali, Sharda Pustak Bhawan, Allahabad
4. Heywoods, I., Cornelius, Sand Carver, S.(2006)An Introduction to Geographical Infromation system. Prentice Hall .Jha, M.M. and Singh, R.B.(2008) Land Use :Reflection on Spatial Informatics Agriculture and Development, New Delhi: Concept.
5. Nag, P.(2008) Introduction to GIS, Concept India, New Delhi.
6. Sarkar, A.(2015)Practical geography :Asystematic approach. Orient Black Swan Private Ltd., New Delhi
7. Singh, R. B. and Murai, S.(1998)Space Informatics for Sustainable Development, Oxford and IBH, New Delhi.

Paper Name	Course Outcome	Critical Thinking:	Effective Communication:	Social Interaction:	Effective Citizenship:	Values and Ethics:	Environment and Sustainability:	Self-directed and Life-long Learning:
		P01	P02	P03	P04	P05	P07	P08
GIS AND REMOTE SENSING	CO104.1		3	3	3	3		3
	CO104.2	1	2	2	3	3	3	3
	CO104.3	3	3		3	1	3	3
	CO104.4	3	3		3	1	3	3
	CO104.5	3			3	3	3	3
	Average	2	2.2	1	3	2.2	2.4	3

Semester-2 (400 Marks, 20 credits)

CONCEPTUAL DEVELOPMENT IN GEOGRAPHY (100 Marks-5Credits)
Core Course CC-201

Course Objective

To Understanding the historical evolution of geographic thought and detailed analysis of different paradigms in geography .Evaluating the contemporary trends in geographical studies.

Course Outcome

CO201.1 Get an overview of the development of geography during different stages and they can appreciate the theoretical development in all the branches of the subject.

CO201.2 Get an opportunity to learn all the important contributions of geographers, the important course of events occurred and influenced the subject, and the changes of themes and scope of the subjects

CO201.3 Be able to understand a broader Perspective of the nature and direction of the subject

Course Contents:

Unit-I:Growth of Geography as a systematic science

Historical development-Contribution of major proponents in geography in the ancient world (The Greeks, The Romans, The Arab, The Indians and The Chinese)Development of Geographical thought during pre and post - modern period An overview: Dualism in geography: Determinism V/S Possibilism; Quantitative vs Qualitative; Systematic vs. Regional Geography

Unit-II: **Revolution in Geography**

Conceptual revolution: Philosophy of Space and distance in geography- Spatial implications and distance decay; Spatial diffusion behavior and movements. Theory of diffusion; Regional concepts and Regional methods in geography and regionalism; Quantitative revolution; Paradigms in geography

Unit-III: **Themes in geography**

Pragmatism; Positivism; functionalism; Radicalism; Existentialism; Idealism; Realism; Marxism; Radicalism; Behaviouralism; Humanism.

Unit-IV:**Contributionsof Geographers**

(Bernhardus Varenius, Immanuel Kant, Alexander von Humboldt, Carl Ritter, Scheafer and ; Hartshorne)

Suggested Readings

1. Milton E. Harvey and Brian P.Holly: themes in geographical thought, Rawat publication.
2. Sharma Y.K.: geographical thoughts, Lakshmi Narain Agarwal.
3. Dikshit. R.D. Geographical thought: A contextual history of ideas eastern economy edition.
4. Lalith Rana: Geographical thought: A systematic record of evolution. Concept publications.
5. David Harvey: explanation in geography, Rawat Publication.
6. Majid Husain: Evolution of geographical thought, Rawat Publication.

Paper Name	Course Outcome	Critical Thinking:	Effective Communication:	Social Interaction:	Effective Citizenship:	Values and Ethics:	Environment and Sustainability:	Self-directed and Life-long Learning:
		P01	P02	P03	P04	P05	P07	P08
CONCEPTUAL DEVELOPMENT IN GEOGRAPHY	CO201.1	1			3	3	3	3
	CO202.2	3	3		3	3	3	3
	CO202.3	3	3	2	3	3	2	3
	Average	2.3	2	0.66	3	3	2.6	3

RESEARCH METHODOLOGY AND SURVEY TECHNIQUES (100Marks-5Credits)
Core Course CC-202

Course Objective:

To provide the idea of research and provide concepts in field work in geographical studies, To provide a detailed understanding related to questionnaire development and preparation of the field report.

Course Outcome:

CO202.1 Be able to understand basic concepts of field research method sand research design in geography.
CO202.2 Be able to do field work through practical experience and get skills of data collection methods and processing and analysis of obtained data.
CO202.3 Be able to write dissertation based on field work on given topic.
CO202.4 Evaluate different data and research technique and effect.

Course Contents:

Unit-I: Fundamentals of Research
Nature of Science: description, causality, prediction and explanation; Nature of natural and behavioural systems; Nature of Geographical enquiries- Physical and Human; Deterministic and non-deterministic approaches. Theorizing our World-ontology, epistemology, research paradigms, methods and methodology; Types of logical reasoning- Inductive, Deductive and Abductive.
Nature and objectives of research; Research Types: descriptive-analytical, pure-applied, conceptual-empirical, and qualitative-quantitative.

Unit-II: Research Process
Stepsin Research process Needs and objectives of Literature Review; Conducting literature survey- searching literature, reviewing selected literature, developing theoretical and conceptual frameworks, Reporting literature review Citation methods- foot note, text note, end note, bibliography, annotated bibliography and citation rules Research Problems-meaning, importance and sources; selecting, defining, stating and evaluating a research

problem; Selection of research objectives; Exercises on writing introduction of a research article [Hypothesis: Definition, sources, roles and types of hypothesis; Tests of hypothesis with small and large samples; Type I and Type II Errors in testing hypotheses.

Research Strategies: Case studies, Experiments, Ethnography, Phenomenology, Grounded Theory, Action Research. Data Collection Methods: Questionnaire, Interview, Focus Group, Participant Observation; Sampling- Concept, principles, factors affecting inferences drawn from a sample; Types of sampling- random and probability sampling designs, systematic sampling; Sample size calculation.

Unit- III: Reading a Scientific Research Paper

Introduction Section: Background, Hypothesis/Research Question, Premise, Logic, Novelty Material and Method Section: Research Design, Data/Materials used, Sampling Strategy, Techniques used Result Section: Coherence, Reliability and validity of data; Important observations. Discussion Section: Interpretation of results and main conclusions.

Unit-IV: **Surveying Methods**

Fundamentals of TS survey and Terrain Mapping with DEM and TIN generation DGPS Survey techniques

Suggested Readings

1. Clifford,N.,Cope,M.,Gillespie,T.,&French,S.(Eds.).(2016).Keymethods in Geography. Sage.
2. Gomez, B., & Jones III,J.P.(Eds.).(2010).Research methods in geography: Acritical introduction (Vol. 6). John Wiley & Sons.
3. Hegde, D.S.(Ed.).(2015).Essays on research methodology. Springer.
4. Kleiner,S.(1993).Thelogic of discovery: A theory of the rationality of scientific research. Springer Science & Business Media.
5. Kumar,R.(2019).Researchmethodology:Astep-by-stepguideforbeginners.Sage Publications Limited.
6. Locharoenrat,K.(2017).ResearchMethodologiesforBeginners.PanStanford.
7. Mellenbergh, G. J., &Adèr, H. J. (Eds.). (1999). Research Methodology in the Life, Behavioural and Social Sciences. Sage.
8. Pruzan,P.(2016).Research methodology: the aims,practices and ethics of science. Springer.
9. Singh, Y. K. (2006). Fundamental of research methodology and statistics. New Age International.
10. Yeong, F. M. (2014). How to Read and Critique a Scientific Research Article: Notes to Guide Students Reading Primary Literature (with Teaching Tips for Faculty Members). World Scientific Publishing Company

Paper Name	Course Outcome	Critical Thinking:	Effective Communication:	Social Interaction:	Effective Citizenship:	Values and Ethics:	Environment and Sustainability:	Self-directed and Life-long Learning:
		P01	P02	P03	P04	P05	P07	P08
RESEARCH METHODS AND SURVEY TECHNIQUES	CO202.1	2	3	3	3	3	3	3
	CO202.2	3	3	3	3	3	3	3
	CO202.3	3	3	3	3	3	3	3
	CO202.4	3	3	2	3	3	3	3
	Average	2.75	3	2.75	3	3	3	3

GEOGRAPHY OF SETTLEMENTS (100Marks-5Credits)
Core Course CC-203

Course Objective:

To provide a comprehensive understanding of both rural and urban settlements, focusing on the dynamics of contemporary urban issues. It explores various aspects of urbanization, including the challenges, policies, and strategies

Course Outcome:

CO203.1 Be able to acquaint with the spatial and structural characteristics of human settlement system under varied environmental conditions
CO203.2 Be able to distinguish the morphological, structural and functional characteristics between rural and urban settlements both in Indian and western perspectives.
CO203.3 Analyze pattern of settlement of different city.
CO203.4 Evaluate problem and policies.

Course Contents:

Unit-I: Concept of rural and urban settlements; Nature, Scope, Significance and approaches to study recent trends in Settlement Geography; Evolution of Settlements in India: Emergence of Village Settlements; rural settlement patterns, Origin and Growth of Towns; Spacing of Settlements –Application of Models of Christaller and Losch and its application; Issues and policies of Settlements, settlement planning; The concept of sustainable cities and sustainable Urban growth.

Unit-II: Rural settlement: Site, location, types and pattern; Rural House types: planned and architectural style in different geographical environment ; Rural Service Centers and their Role in Urbanization Process. Indian Rural Settlements in Different Micro-Environmental Conditions:
(a) Mountains (b) Desert Region (c) In the vicinity of Urban Centers; Rural- Urban fringe: Meaning, characteristics,
Unit-III: Urban Settlements: Urbanization Concepts and process: meaning of urban settlements and Urbanization. Urban morphology, sphere of urban influence, Classification of Urban Places, Non-Functional and Functional. Behavioral structural and demographic concept of Urbanization, distribution and evolution of cities through historical times, Settlement systems- primate city, rank- size rule, settlement hierarchy.

Unit - IV: Contemporary Urban issues: Concepts of city region, Characteristics and demarcation, Nature of Urban influence. Contemporary Urban issues: Price of land and vertical and horizontal growth of cities, Urban sprawl, Scarcity of housing and growth of slums, problems of civic amenities, urban transport problem, Environmental pollution. Smart cities, AMRUT,(Atal Mission for Rejuvenation and Urban Transformation)PMAY(Pradhan Mantri Awazyojana)DAY (Deen Dayal Antyodaya Yojana) RAY (Rajiv Gandhi Awaz Yojna) JNNURM (Jawaharlal Nehru National Urban Renewal Mission) SBM-U (Swatch Bhart Mission – Urban)

Suggested Readings

1. Hudson, F.S.(1976)Geography of Settlements, Macdonald ,London.
2. Northam Ray, M.(1979).Urban Geography, John Wiley and Sons, New York.
3. Ambrose,Peter,1970:Concepts in Geography,Vol.-I, Settlement Pattern, Longman.
4. Baskin,C.,(Translator)1996: Central Places in Southern Germany, Prentice-HallInc. Englewood Cliffs New Jersey.
5. Haggett, Peter, Andrew D. Cliff and Allen Frey(Ed.)1979:Locational ModelsArnold Heinemann.
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7. Mayer, M. Harold and Clyde F.Kohn(Ed.)1967Readings in urban Geography, Central Book Depot, Allahabad.
8. Mitra, Asok, MukherjeeS andBose,R.,1980: Indian Cities Abhinav Publications, New Delhi.

9. Nangia,Sudesh,1976: Delhi Metrpolitan Region, K.B. Publications, New Delhi.
10. Prakasa,Rao,V.L.S.,1992:Urbanisation in India: Spatial Dimensions, Concept Publishing Co., New Delhi.
11. Ramachandran, R.,1992: Urbanisation and Urban Systems in India, Oxford University Press, New Delhi.
12. Singh, R.L. and Kashi Nath Singh(Ed.)1975:Readings in Rural Settlement Geography, National Geographical Society of India, Varanasi.

Paper Name	Course Outcome	Critical Thinking:	Effective Communication:	Social Interaction:	Effective Citizenship:	Values and Ethics:	Environment and Sustainability:	Self-directed and Life-long Learning:
		P01	P02	P03	P04	P05	P07	P08
GEOGRAPHY OF SETTLEMENT	CO203.1			2	3	3	3	3
	CO203.2	3	3	3	3	3	3	3
	CO203.3	3	3	1	3	2	3	3
	CO203.4	3	3	3	3	3	3	3
	Average	2.25	2.25	2.25	3	2.75	3	3

REGIONAL GEOGRAPHY OF JHARKHAND (100Marks-5Credits)
Core Course CC-204

Course Objective:

To provide an in-depth understanding of the region's physiography, the distribution of minerals, natural hazards, and demographic patterns. It also focuses on the diverse distribution of tribal communities, highlighting the region's unique geographic and socio-cultural characteristics.

Course Outcome:

CO204.1 Students will lean in to the physiography, drainage, climate and agricultural scenario of Jharkhand.
CO204.2 Know the industrial and mineral availability in Jharkhand with knowing the natural vegetation intensity.
CO204.3 Students will understand the natural hazards and vulnerability of Jharkhand against the multi-hazards.
CO204.4 Understand the demography and spatial distribution of various tribes in Jharkhand.

Course Content:
Unit-I: Introduction (Location, Administrative History); Physiographic divisions, Geological structure; Climate – Climatic regions & Rainfall regions; Soil (Types, Distribution, Conservation Measures);Natural Vegetation (Forest Types, Distribution, Forest Products and NTFPs Collection, WildLife - Bio-sphere reserve, National Park, Wild Life Sanctuary and Eco-Tourism)

Unit-II: Drainage System, Drainage Basins & its Salient Features; Irrigation System, Multi- Purpose Irrigation Project (Major, Medium, Minor), Ground Water(Qualitative and quantitative) & its Distribution Energy Resources; Agriculture (Types & Characteristics, Spatial Distribution, Production), Agro-Climatic

Zones; Natural Hazards and Disasters in Jharkhand (Cyclones, Floods, Droughts, Earthquakes, Heat waves, Lightening etc., Biological Disaster & Its Impact, Disaster Management& Policies;

Unit-III: Mineral Resources (Iron, Manganese, Bauxite, Coal);Industries (Large Scale, Medium Scale, Small Scale-Cottage, Handicraft), Industrial areas, Industrial Policies; Transport (Types & Distribution);Tourism (Types, Important Tourist Place, Road Maps, Earnings from Tourism); Geomorphosites, Geo-heritages & their prospects in Jharkhand; Economic Development and Planning (Backward Region Planning-KBK), Geopolitics

Unit-IV: Demographic Division (Distribution, Density, Growth & Migration);Population Composition (Sex Composition, Age Structure, Regional Composition; Rural/Urban Composition-Literacy, Occupational Structure), Problems and Prospects of Education in Jharkhand (Primary, Secondary & Higher Education); People, Society & Culture (Spatial Distribution of Social Groups-Tribes, Tribal development Plan); Religion, Caste, Languages & Cultural Practices); Health Care Planning & Problems in Jharkhand; Urbanization in Jharkhand and Associated Problems (Urban Flooding, Slums, Pollution-Water, Air, Noise)

Paper Name	Course Outcome	Critical Thinking:	Effective Communication:	Social Interaction:	Effective Citizenship:	Values and Ethics:	Environment and Sustainability:	Self-directed and Life-long Learning:
		P01	P02	P03	P04	P05	P07	P08
REGIONAL GEOGRAPHY OF JHARKHAND	CO204.1		3	1	3	3	3	3
	CO204.2		2	1	3	3	3	3
	CO204.3	2	3	3	3	3	3	3
	CO204.4	3	3	3	3	3	3	3
	Average	1.25	2.75	2	3	3	3	3

Semester-3(400Marks,20credits)

ENVIRONMENTAL GEOGRAPHY(100Marks-5Credits)
Core Course CC-301

Course Objective:

To gain a thorough understanding of various dimensions of the environment, including ecological, social, and economic aspects, and critically assess environmental and natural resource issues, with a focus on conservation methods and strategies for sustainable development and resource utilization.

Course Outcome:

CO301.1 Understand the dynamic interactive relationship between man and environment.
CO301.2 Have sound understanding on distribution, utilization and proper management of natural resources at global level.
CO301.3 Make assessment and review of planning and policies related to environment and natural resources.
CO301.4 Understand the fundamental concepts of coupled human-environment system.

Course Content:

Unit- I: Man and Environment Interdependence and Interrelationship. Population, Poverty and Economic Development, Environmental Resources Problems, Cultural Changes and Sustainability (Agricultural Revolution, Industrial Revolution and Information/Globalization Revolution).Environmental Movements in India.

Unit- II: Environmental and Social Impact Assessment: Alternative Concepts, Origin and Evolution, Process and Evaluation Methods. Goals and Principles of EIA/ SIA, Perennial Problems in EIA/ SIA Implementation. Effects of EIA/ SIA on Development Projects; Case Studies and Examples.

Unit- III: Air Pollution: Major Air Pollutants, Their Source and Health Effects, Current Levels of Air Pollution in major Cities in India, Indoor Air Pollution, Photochemical and Industrial Fog, Acid Deposition. Water Pollution : Sources ,Types ,Criteria and Effect on Human Health. Eutrophication, Total suspended solids (TSS) and Total Dissolved Solids (TDS) in water. Regional Scenario of Surface Water Pollution in India and Control Strategies. Environmental Hazards (Biological and chemical) and its Effect on Human Health. Solid Waste Management Act in India. Urban waste Management(Solid and liquid)in Major Cities in India and Jharkhand with Special Reference to Swatch Bharat Mission and Smart City Project.

Unit - IV: Sustainable Development: Concept, History, Definition and Goal; Dimensions of Sustainable Development, Green Technology and Green Development, Eco feminism. Sustainable Use of Natural Resources: Concept of Reuse, Recover, and Recycle (3Rs). Principles of Carrying Capacity and Eco-Development. National Programme and Policies in India: National Clean Air; National Action Plan on Climate Change, National Environmental Policies of India; International Treaties, Programmes and Polices on Environment. Case Studies from World/India/Jharkhand.

Suggested Readings

1. United Nations, ESCAP (1991).Environmental Impact Assessment :A Management Tool for Development Projects, New York.
2. G. Miller and Scott Spoolman(2018).Environmental Science, Brooks/Cole;16th edition.
3. Henk, A. Becker (1997). Social Impact Assessment: Method and experience in Europe, North America and the Developing World.UCL Press.
4. Frank Vanclay and Daniel A. Bronste in(1996). Environmental and Social Imapact Assessment ,Johnwiley & Sons Ltd.
5. Y. Anjaneyulu and Valli Manickam (2007). Environmental Impact Assessment Methodologies, BS Publications, Hyderabad.
6. Sunita Nayan (2016). Why I should be Tolerant: On environment and environmentalism in the 21st

century, Centre for science and Environment.
7. David Reid(1995).Sustainable Development CAU Introductory Guide. Earths can Publication Ltd. London.
8. JonathanTurk(1989).IntroductiontoEnvironmentalStudies,SaundersCollegePublishing.
9. United Nations(1992).Agenda21:ProgrammeofActionforSustainable Development(Rio Declaration on Environment and Development), New York.
10. Nicholas Polunin (1971). The Environmental Future, Macmillan, in 6. Nicholas Polunin (eds.)ProceedingsofthefirstInternationalConferenceonEnvironmentalFuture,Palgrave Macmillan UK.
11. I.G.Simmons(1993).InterpretingNature(CulturalConstructionsoftheEnvironment).Routledge. London and New York.
12. P. A. Merriman and C.W.A. Browitt (1993).Natural Disasters: Protecting Vulnerable Communities, Thomas Telford, London.
13. P.R. Ehvlich, A. H. Ehrlich &J.P.Holderen(1978).Eco-Science Population, Resources and Environment, W.H.Freeman& Co Ltd, Sanfrancisco.
14. Pears Nigel(1977).Basic Bio-Geography, Longman Publishers, London.
15. R., U. Cooke and J.C. Doornkamp (1974). Geomorphology in Environmental Management: An Introduction, Oxford University Press, London.
16. SavindraSingh(1991).EnvironmentalGeography,PrayagPustakBhawan,Allahabad.19
17. A.N.StrahlerandA.H.,Strahler(1977).Geography&Man'sEnvironment,JohnWiley& Sons, New York.
18. H.H. Singh,Prithvish Nag, V. K. Kumra and Jagdish Singh(1985).Geography & Environment: Issues and Challenges, Concept Publishing Company, New Delhi.
19. Desh Bandhoo & Ekalvya Chauhan (1977). Current Trends in Indian Environment, Today & Tomorrow Publisher, New Delhi.
20. A. N. Strahler& A. H. Strahler (1973). Environmental Geo-Sciences - Interaction Between Natural System and Man, Wiley International Edition, Hamilten Publishing Company, Santa Barbara, California.
21. K. S. K. Valdiya (1987). Environmental Geography-Indian Context, Tata McGraw Hill Publishing Company, New Delhi.
22. Daniel D. Chiras (1997). Environmental Science Action for a Sustainable Future, The Benjamin/Cummings Publishing Company, Inc.
23. United Nations (2015). Integrating the three dimensions of sustainable development: A framework and tools.
24. UNEP(1997).GlobalEnvironmentOutlookOxfordUniversityPress,NewYork.
25. Govt.ofIndia(2018).SmartCitiesMission.(http://smartcities.gov.in/content/).
26. Govt.ofIndia(2018).SwachhBharatUrban.(http://swachhbharaturban.gov.in/)

Paper Name	Course Outcome	Critical Thinking:	Effective Communication:	Social Interaction:	Effective Citizenship:	Values and Ethics:	Environment and Sustainability:	Self-directed and Life-long Learning:
		P01	P02	P03	P04	P05	P07	P08
ENVIROMENTAL GEOGRAPHY	CO301.1			2	3	3	3	3
	CO301.2	1	2	1	3	3	3	3
	CO301.3	3	3	3	3	3	3	3
	CO301.4	3	3	3	3	3	3	3
	Average	1.75	2	2.25	3	3	3	3

OCEANOGRAPHY(100Marks-5Credits)
Core Course CC-302

Course Objective:

To provide an in-depth understanding of ocean physiography , to explore key oceanographic variables such as temperature, salinity, and their distribution patterns across different oceanic regions. and to analyze human impacts on marine communities, including coastal pollution and its consequences on marine biodiversity, particularly fisheries.

Course Outcome:

CO302.1 Understand the oceanic process and availability of resources
CO302.2 Understand the evolution of various oceanic topography and features
CO302.3 Know various process related to oceanic circulation and effect on globe

Course Content:

Unit-I: Meaning, nature and scope of Oceanography, Tectonic evolution of ocean basins, Bottom Relief of Oceans, Relief Features of Atlantic, Indian and Pacific

Unit-II: Composition of sea water, Temperature, Density, Salinity of Oceans, its distribution & Determinants, T-S Diagram. Ocean Deposits – Classification & Distribution, Factors controlling the deposition and distribution of oceanic sediments.

Unit-III: Ocean Circulation – Ocean Currents Waves & Tides – Types & Characteristics. Factors associated with origin of Ocean Currents and its Impacts. Ocean Currents of Atlantic, Indian & Pacific Oceans.

Unit – IV: Sea-level processes and sea-level change, transgression, regression, relative and eustatic sea level change, causes and consequences of sea level change, Pleistocene sea level. Hazards: Tsunami & Cyclone. Coral reefs & atoll: types & theories of origin. Marine Resources – Human Impact on Marine Communities. Coastal pollution & its impact on marine biodiversity including fisheries.

Suggested Readings

1. Basu, S.K.(2003).Hand book of Oceanography. Global Vision, Delhi.
2. Bird, E.(2000).Coastal geomorphology-An introduction .John Wiley&Sons.28
3. Davis Richard,A.C.(1972).Oceanography. Addition Wesky Publishing Co.
4. Garrison, T.M.(1999).Oceanography. Barooks/Cole Wadsworth, New York.
5. Garrison, T.N.(2004).Essentials of Oceanography. Thompson. Australia.
6. Grant Gross, M.(1982).Oceanography ,Prentice. HallInce, New Jersey.
7. King Cuchlain, A.M.(1962).Oceanography for Geographers. Edward Arnold.
8. Pethic John (1984).An Introduction to coastal Geomorphology .Arnold Heinemann ,London.
9. Sharma and Vatal(1962). Oceanography for Geographers. Chaitnaya Publishing House, Allahabad.
10. Singh Savindra.(2012).Oceanography. Prayag Pustak Bhawan ,Allahabad
11. Thurman Harold,V.(1985).Introductory Oceanography. Belland Howell Co, London.
12. Tooley,M.M.and Shennan.(1987).Sea Level Change, Basil Blackwell, Oxford, U.K

Paper Name	Course Outcome	Critical Thinking:	Effective Communication:	Social Interaction:	Effective Citizenship:	Values and Ethics:	Environment and Sustainability:	Self-directed and Life-long Learning:
		P01	P02	P03	P04	P05	P07	P08
OCEANOGRAPHY	CO302.1		3		3		3	3
	CO302.2		3		3	1	3	3
	CO302.3	1	3	1	3	3	3	3
	Average	0.3	3	0.3	3	1	3	3

HYDROLOGY AND WATER RESOURCES MANAGEMENT(100Marks-5Credits)
Core Course CC-303
Course Objective:

To provide students with a comprehensive understanding of hydrological processes, water resources, and the management of water in both surface and subsurface systems. Students will able to use different tools to assess, plan, and manage water resources efficiently.

Course Outcome:

CO303.1 Apply the water balance equation to various hydrological problems in time and space.
CO303.2 Describe how components of the water cycle are influenced by human activities.
CO303.3 Analyse hydrological data in order to evaluate water resource management in an area.
CO303.4 Evaluate contemporary issues .

Course Content:

Unit-I: Introduction: The history of hydrology, System Concept in hydrology, hydrologic cycle, elements of hydrologic cycle, human impact on the hydrologic cycle, water balance.

Unit-II: Surface Water Hydrology: River basin and problems of regional hydrology, sources of stream flow, stream flow hydrograph, stream flow measurement, rainfall-runoff relationships, flow duration curve, surface water resource of India, wetlands hydrology.

Unit-III: Ground water Hydrology: Divisions of subsurface water, formations according to their water-bearing properties, types of aquifer and aquifer properties, Darcy's law and elementary groundwater flow equation, geological formations as aquifers, groundwater monitoring, groundwater resource estimation.

Unit-IV: Contemporary Issues and Challenges: Drought, flood, water use conflicts, water quality and major water pollutants (points and non-point source), water quality criteria for different uses.

Unit-V: Water Resource Planning, Management and Policy: Water resources management (demand and supply side), watershed management, water harvesting, national water policy.

Suggested Readings:

1. Abbas, B. M.1982.The Ganges Water Dispute ,Vikas Publishing House Pvt .Ltd .,New Delhi.
2. Aggarwal ,A .1991 .Floods ,Flood plains and Environmental Myths ,Centre for Science and Environment, New Delhi.
3. Andrew, D. W. and Trimble,S.2004. Environmental Hydrology,2nd Edition, Lewis Publishers, CRC Press.
4. Beek, E., Loucks ,P.D.2005.Water Resource Systems Planning and Management :An Introduction to Methods, Models and Applications, UNESCO, Paris.
5. Bhattacharya ,S.K.1988 .Urban Domestic Water Supply in Developing Countries ,CBS Publishers, CR Distributors, Delhi.
6. Chow, V. T., Maidment, D .R. and Mays,W.L.1988. Applied Hydrology, Mc Graw-Hill International Editions, Mc Graw-Hill Book Company, New York.
7. Beach, Tim and Jonathan, M.F. 2017. Wetland Hydrology: The International Encyclopaedia of Geography, Wiley Online Library.
8. Jain, S .K ., Aggarwal ,P.K. and Singh,V.P.2007.Hydrology and Water Resources of India, Springer, The Netherlands.
9. Karanth, K.R. 1988. Ground water: Exploration, Assessment and Development, Tata-McGraw Hill, New Delhi.
10. MahajanG.1989.Evaluation and Development of Ground water, Ashish Publishing House, New Delhi.
11. Micklin,Philip,P.1996.Manand the water cycle: challenges for the21stcentury, Geojournal,39 (3): 285-298.
12. Rai, S.C. 2017. Hydrology and Water Resources: A Geographical Perspective, Ane Book Pvt. Ltd., New Delhi.
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14. Subramanya , K.2010. Engineering Hydrology, Tata McGraw Hill Education Pvt. Ltd. New Delhi.
15. Thornthwaite, C.W. and Mather, J.R. 1957. Instructions and Tables for Computing Potential Evapotranspiration and the Water Balance, Drexel Institute of Technology, Centerton, New Jersy.
16. Todd , D. K.1980.Ground water Hydrology ,John Wiley ,New York.

Paper Name	Course Outcome	Critical Thinking:	Effective Communication:	Social Interaction:	Effective Citizenship:	Values and Ethics:	Environment and Sustainability:	Self-directed and Life-long Learning:
		P01	P02	P03	P04	P05	P07	P08
HYDROLOGY AND WATER RESOURCES MANAGEMENT	CO303.1		1		3	3	3	3
	CO303.2	3	3	3	3	3	3	3
	CO303.3	3	3	3	3	3	3	3
	CO303.4	3	3		3	3	3	3
	Average	2.25	2.5	1.5	3	3	3	3

STATISTICAL METHODS IN GEOGRAPHY(100Marks-5Credits)
Core Course CC-304

Course Objective:

To provide students with a foundational understanding of statistical methods and tools used in data analysis, including central tendency measures, probability distributions, correlation, regression, hypothesis testing, and advanced techniques

Course Outcome:

CO304.1 Understand the basics of data collection and processing for the meaningful outcomes.
CO304.2 Comprehend there presentation and interpretation of the results.
CO304.3 Putin to practice results obtained in Representation as well as day-to-day life.
CO304.4 Evaluate geographical data and its utilization.

Course Content:

Unit-I: Measures of Central Tendencies :Arithmetic Mean ,Median ,Mode ,and Their Characteristics. Measures of Dispersion and Variability: Range (Percentile and Quartile Range), Mean Deviation, Standard Deviation. Measure of Inequalities and Disparities: (Gini coefficient, Sopher Index)

Unit-II: Concept of Probability Distributions :Binomial Distributions ,Normal Probability Distribution. Correlation: Pearson Product Moment Correlation Coefficient ,Spearman's Rank Correlation Coefficient. Regression Analysis and Its Significance: Bi-Variate /Scatter ,Linear Relationship (Straight Line Regression for Two Variables).

Unit-III: Hypothesis Testing: Formulation, Rejection Rule, One and Two Tailed Tests, Significance Level, Degrees of Freedom, Standard Error. Different Types of Significance Test: Chi-Square Test, Z- Test, T- Test.

Unit–IV: Indicators Scale Free ,Computation of Composite Index, Principal Component Analysis and Cluster Analysis. Sampling Techniques and Determination of Sample Size. Demonstration and Use of SPSS Software for Statistical Analysis.

Suggested Readings

1) Miah, Abdul Quader (2016).Applied Statistics for Social and Management Sciences, Springer Publisher, Singapo10
2) Gregory, S.(1969).Statistical Methods and the Geographer, Longman.
3) Gilbert, Norma(1981).Statistics ,Saunders College Publishing ,Philadelphia.
4) Theaks tone and Harrison(1970).Analysis of geographical Data, Heinemann; First Edition.
5) Matthews, John, A. (1979). Quantitative and Statistical Approaches to Geography, Pergamon Press.
6) C.B. Gupta & Vijay Gupta(2004).An Introduction to statistical Methods, Vikas Publishing House Pvt. Ltd., New Delhi.
7) Leslie, J. King(1969).Statistical Analysis in Geography ,Prentice Hall ,Engelwood Cliffs.
8) Silk, John(1979).Statistical concepts in Geography, Harper Collins Publishers Ltd, London.
9) John MacInnes(2017).An Introduction to Secondary Data Analysis with IBMSPSS Statistics, SAGE Publications, New Delhi.
10) Miah, Abdul Quader(2016).AppliedStatisticsforSocialandManagementSciences,Springer Publisher, Singapore.
11) Gregory, S.(1969).Statistical Methods and the Geographer ,Longman.
12) Gilbert, Norma(1981).Statistics, Saunders College Publishing ,Philadelphia.
13) Theaks tone and Harrison(1970).AnalysisofgeographicalData,Heinemann;FirstEdition.
14) Matthews, John, A.(1979).Quantitative and Statistical Approaches to Geography, Pergamon Press.
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18) John MacInnes (2017).An Introduction to Secondary Data Analysis with IBMSPSS Statistics, SAGE Publications, New Delhi

Paper Name	Course Outcome	Critical Thinking:	Effective Communication:	Social Interaction:	Effective Citizenship:	Values and Ethics:	Environment and Sustainability:	Self-directed and Life-long Learning:
		P01	P02	P03	P04	P05	P07	P08
STATISTICAL METHODS IN GEOGRAPHY	CO304.1		3		3	3	3	3
	CO304.2		3	3	2	3	3	3
	CO304.3		2	3	3	3	3	
	CO304.4	3	3	3	3	3	3	3
	Average	0.75	2.75	2.25	2.75	3	3	0.75

Semester-4(400 Marks, 20 credits)

NATURAL HAZARDS & DISASTER MANAGEMENT (100Marks-5 Credits)
Core Course CC-401

Course Objective:

To provide a comprehensive understanding of various natural hazards and To familiarize students with the disaster management cycle and its various roles . To provide details about various agencies and stakeholders in disaster management.

Course Outcome:

CO401.1 Understand processes and impact of disaster.
CO401.2 Understand both the natural and man-made disaster and human negligence in context of Environment.
CO401.3 Gain a perspective of disasters and various dimensions of disaster management
CO401.4 Have comprehensive knowledge of various natural and manmade Disasters in India.
CO401.5 Examine the response and mitigation measures of disasters.

Course Content:

Unit-I: Natural Hazards and Disasters: Meaning and Concept, Dimensions and Implications of Disasters. Disaster management: Legislation, Institutional/organizational Frameworks and Disaster management Policies with Special Reference to India and Jharkhand.

Unit-II: Type, Occurrence and Characteristics of Disaster: Earthquake, Flood, Cyclone, Drought, Volcanic Eruption, Tsunami, Landslide, Bushfire, Epidemic, Hailstorms, Heat wave. Case Studies from Jharkhand /India.

Unit- III: Vulnerability and Risk: Concept, Assessment Methods; Vulnerability Analysis; Major Requirements for Coping with Disaster. Role of NGOs, Warning System, Public Awareness and Community Participation in Disaster Management

Unit-IV: Concept and components of Disaster Management Cycle: Long Term Measures (Prevention and Mitigation); Prior to Disaster Impact (Preparedness), Response to Disaster Impact (Response), Post Impact Factors (Recovery, Post Disaster Review and Development). Case Studies from Jharkhand /India

Suggested Readings

1. P.A. Merriman and C. W. A. Browitt (Edited) (1993). Natural Disasters: Protecting Vulnerable Communities. Thomas Telford, London.
2. Carter, W. Nick, (1991). Disaster Mitigation: A Disaster Manager's Handbook. Asian Development Bank.
3. Asian Development Bank (1991). Disaster Mitigation in Asia and Pacific. Asian Development Bank, Manila, Philippines.
4. Government of India (2009). National Policy on Disaster Management, Ministry of Home Affairs
5. Government of India(2005).The Gazette on disaster management Act,2005.
6. P.R. Ehrlich, A.H. Ehrlich & J. P. Holderen (1972). Eco-Science Population, Resources and Environment. Freeman and Company, Sanfrancisco.
7. G.F., White (1974). Natural Hazards: Local, National & Global (Ed). Oxford University Press, London.
8. Cooper, M. (2019). Seven Dimensions of Disaster: The Sendai Framework and the Social

Construction of Catastrophe. In K. Samuel, M. Aronsson -Storrier, & K. Bookmiller (Eds.), The Cambridge Handbook of Disaster Risk Reduction and International Law (pp.17-51). Cambridge: Cambridge University Press. doi:10.1017/9781108564540.004
9. UN(2009).UNISDR Terminology on Disaster Risk Reduction.
10. Du, Y., Ding, Y., Li, Z., & Cao, G. (2015). The role of hazard vulnerability assessments in disaster preparedness and prevention in China. Military Medical Research, 2(1), 1-7.
11. Rehman, S., Sahana, M., Hong, H., Sajjad, H., & Ahmed, B. B. (2019). A systematic review on approaches and methods used for flood vulnerability assessment: framework for future research. Natural Hazards, 96(2), 975-998.
12. Building Materials and Technology Promotion Council (2019). VULNERABILITY ATLAS OF INDIA. (https://bmtpc.org/DataFiles/CMS/file/VAI2019/background.pdf).

Paper Name	Course Outcome	Critical Thinking:	Effective Communication:	Social Interaction:	Effective Citizenship:	Values and Ethics:	Environment and Sustainability:	Self-directed and Life-long Learning:
		P01	P02	P03	P04	P05	P07	P08
NATURAL HAZARDS & DISASTER MANAGEMENT	CO401.1	1	3	2	3	3	3	3
	CO401.2	2	3	2	3	3	3	3
	CO401.3	1	2	3	3	3	3	3
	CO401.4	3	3	3	3	3	3	3
	CO401.5	3	3	3	3	3	3	3
	Average	2	2.8	2.6	3	3	3	3

Special Paper(Group –A)
TEOPICAL METEOROLOGY AND CLIMATOLOGY(100 Marks-5Credits)
Elective Course EC-402
Course Objective:

To provide an in-depth understanding of the principles and processes underlying the tropical climatic system, weather phenomena, and their impacts.

Course Outcome:

CO402A.1 Understand the elements of weather and climate and its impact sat different scales.
CO402A.2 Comprehend the climatic aspects and its bearing on planet earth.
CO402A.3 Analyse climate change and different policies.

Course Content:

Unit-I: Weather and climate; Components of the climate system and feedbacks to climate. Radiation climatology of the earth's atmosphere ;geographical and seasonal distribution of

incoming solar radiation; outgoing radiation; net radiation; terrestrial heat balance. Geographical and seasonal distributions of temperature, pressure, wind, precipitation, vertical distribution of temperature and winds.

Unit-II: Climatology of air masses: Origin, movement and modification of air masses; fronts and convergence zones; weather associated with frontal zones. Classification of climates: Koeppen and Thornthwaite's schemes

Unit- III: Large scale planetary systems: Trade wind and ITCZ; Hadley and Walker circulation; Jet streams; Madden Julian oscillation; easterly waves Tropical cyclones: Grey-Sikka conditions; life cycle; structure in wind; temperature; introduction to various theories; cyclone movement; storm surges.

Unit-IV: Monsoons: climatological features and seasonal evolution of Indian summer monsoon; principal rain bearing systems including monsoon depressions, lows; mid-tropospheric cyclones; intra seasonal variability of summer monsoon including active and break cycles; monsoon variability on inter annual and decadal time scales; impacts from tropical oceanic drivers such as the ENSO and IOD; northeast monsoon ; Meso scale systems: Thunder storm; dust storm; hail storm; tornado; sea and land breeze.

Reference Books:

1. Monsoon monographs Vol-IandVol-II,2010:India Meteorological Department
2. Rao,Y.P.,SouthWestMonsoon,IMD,1976.
3. Pant, G. B., and K. Rupa kumar, Climates of South Asia, J. Wiley and Sons: Chichester,1997.
4. Chang, C. P. and T. N. Krishnmoorthy, Monsoon Meteorology, Oxford University Press,1987.
5. Anthes , R. A., Tropical Cyclones, their evolution structure and effect, American Meteorological Society, 1982.
6. Asnani , G.C., Tropical Meteorology.
7. Trewartha, G. T., An Introduction to climate, McGraw-Hill.
8. Pandharinath,N.,AviationMeteorology,B.S.Publications,2012
9. Atkinson, B. W., Mesoscale atmospheric circulations.
10. Shaw, D. B., Meteorology over the Tropical Oceans, Royal Meteorological Society publication 1979.
11. Sellers, W. D., Physical Climatology, University of Chicago Press, 1965.
12. Neelin , J ,D., Climate Change and Climate Modelling, Cambridge University Press,2011. Barrry, R.

Paper Name	Course Outcome	Critical Thinking:	Effective Communication:	Social Interaction:	Effective Citizenship:	Values and Ethics:	Environment and Sustainability:	Self-directed and Life-long Learning:
TROPICAL METEOROLOGY AND CLIMATETOLOGY	CO402A.1	1	2	3	3	3	3	3
	CO402A.2	2	3	3	3	3	3	3
	CO402A.3	3	3	2	3	3	3	3
	Average	2	2.6	2.6	3	3	3	3

Special Paper (Group–A)
CLIMATE CHANGE AND IT'S IMPACTS (100Marks-5Credits)
ELECTIVE COURSE EC-403

Course Objective:

To focus on various variables of climate and its changing trends and how its impacting on people and environment . To provide awareness about different polices and their benefits

Course Outcome:

CO403A.1 Distinguish between the elements of weather and climate with assessing their impacts at different scales.
CO403A.2 Able to justify the relationship between atmospheric pressure and various types of wind actions inculcated with it. Able to design diverse methods of collecting the hydrological information, which is essential to understand surface and groundwater hydrology
CO403A.3 Able to relate the knowledge about the workings of the atmosphere and the interconnections inherent in the climate system
CO403A.4 Develop and describe weather systems including monsoon and their critical roles in producing global and regional weather and climate patterns.
CO403A.5 Properly identify the atmospheric conditions and the result anteing stability in different parts of the world.

Course Content:

Unit-I: Overview of the climatic history of the earth; theories of climatic changes ;Climatic change and climatic variability: local and planetary influences; Milankovitch cycles- eccentricity, tilt and precision cycles; internal feed backs; Dansgaard- Oeshger cycles; Thermohaline circulation and its effect on climate.

Unit-II: Paleoclimate archives: micro fossils; dendrochronology; sclerochronology; lake and ocean varve sediments; foraminifera; oxygen isotope stratigraphy; loess deposits; Ice cores - polar and tropical ice cores; speleothems; pollen grains.

Unit- III: Natural and Human Causes of Climate Change: Plate Tectonics, Volcanic Activity, Orbital Variations, Solar Variability, Global Warming, Ozone Depletion; Impact of Human Activities on Global Climate. Distinguish between the elements of weather and climate with assessing their

impacts at different scales.

Unit-IV: Global warming: Relevance of greenhouse gases and aerosols; other climate forcings; climate change scenarios IPCC AR5* SPM report: Recent climate change and detection; future projection; mitigation; adaptation; Sea level change: modelling and predicting climate change. [*to be replaced by the latest IPCC SPM report as and when it gets released]

Reference Books:

1. Paleo climates: Understanding Climate Change Past and Present: Thomas Cronin
2. Climate and Evolution: William Diller Matthew
3. Principles of Paleo climatology: Thomas Cronin
4. Climatic Changes; Their Nature and Causes: Ellsworth Huntington
5. Barrry , R. G. ,and R .J .Chorley ,Atmosphere Weather and Climate ,9th edition ,Routledge publishers, 2010.
6. Hartmann ,D .,Global Physical Climatology, 2nd edition, Elsevier Academic Press, 2015.
7. General Climatology :H .J .Critch field, Prentice Hall(1964)
8. An introduction to climate: G. T. Trewartha
9. World Climatology–An Environmental Approach,1974edition:*J.*.G. Lockwood, Edward Arnold press, London.
10. Sellers,W.D.,PhysicalClimatology,UniversityofChicagoPress,1965

Paper Name	Course Outcome	Critical Thinking:	Effective Communication:	Social Interaction:	Effective Citizenship:	Values and Ethics:	Environment and Sustainability:	Self-directed and Life-long Learning:
CLIMATE CHANGE AND ITS IMPACTS	CO403A.1	1	2	2	3	2	3	3
	CO403A.2	3	3	2	3	3	3	3
	CO403A.3	1	2	1	3	3	3	3
	CO403A.4	3	3	1	3	3	3	3
	CO403A.5	3	3	2	3	3	3	3
	Average	2.2	2.6	2.4	3	2.8	3	3

Special Paper (Group–B)
GIS AND ITS APPLICATION(100Marks-5Credits)
ELECTIVE COURSE EC-402
Course Objective:

To provide basic understanding of GIS and to provide hands-on experience on GIS software and its application on different sector.

Course Outcome:

CO402B.1 Understand various components and principles of GIS
CO402B.2 Construct the thematic maps using different digital layers
CO402B.3 Have comprehensive understand of GIS for the construction of maps and their use the Development planning

Course Content:

Unit-I: Introduction to GIS :Definition ,Concept ,Evolution components ,Objective and scope, Hardware and software requirements, General data base concept: Spatial and Non spatial data

Unit-II: GIS Database :Geographic data sources ;Land survey, remote sensing ,census and sampling , Data Quality, Sources of error & Natural variations ,Data conversions ;Relational Data base model, data compression, GIS functioning ;Data-digitizing and scanning- preprocessing-Data manipulation, analysis

Unit-III: GIS data structure and management Data Structure; Raster and Vector, Database Management Systems, Concept of DEM, DTM & DSM. Digital Elevation Models (DEM); Characteristics and applications, Web-based GIS; Definition, methods and applications

Unit-IV GIS Applications Integration of GIS and Remote sensing, GIS as decision making tools, GIS application areas; Urban Planning and Environmental Planning. Disaster Management, Agriculture. Google Earth Applications.

References Books:

1. Anjali Reddy, M .Remote sensing and Geographical information Systems Book Syndicate Hydrabad, 2000
2. Arnoff S.: Geographic information Systems :A Management Perspective .D D L Publication Ottawa.1989.
3. C. P .Lo and Albert K .W .Yeung. Concepts and Techniques of Geographic Information System.2002 Prentice-,Hall India,
4. ESRI. Understanding GIS-Redlands, USA:ESRI
5. Fazalshahab. GIS Basics, New Age International Publishers, New Delhi.
6. Fraser Taylor D. R Geographic Information Systems. Pergamon Press Oxford,1991
7. Geoge B Korte, P. E. The GIS Book, Thomson Asia Pte Ltd, Singapore
8. Heywood I(el.)An Introduction to Geographical Information Systems Pearson(2011)
9. Lan Heywood, Sarah Cornelius ,Steve Carver :An introduction to Geographical Information Systems, Longman,1998.
10. Kang-Tsung-Chang, Introduction to Geographical Information Systems ,2002 Mc G Raw Hill. Lemmerns Rob, Internet GIS Applications ITC.
11. Maquire D .J, M. F. Goodchild and D. WRhind (eds).Geographic information Systems: Principles and Application. Taylor and Francis, Washington , 1991
12. Mark S Mononier .Computer Assisted Cartography Pretice Hall ,Engle word Cliff, New Jesey,1982
13. P.A Burrough and R .A. McDonnell, Priciples of Geographical Information System,2000 Oxford University Press.
14. Paul A Lonfley, Michel F. Goodchild, d J. Maguire and D.W. Rhind, Introduction to Geographic Information Systems and Science ,2002, John Wiley and Sons Ltd
15. Peuquet D. J. And D. F. Marble. Introductory Reading in Geographic information Systems, Taylor & Francis Washington,1990.
16. Sahu , LaliCharan .Text Book of Remote Sensing and Geographical Information Systems. Atlantic publishers and distributers, New Delhi.
17. Star ,J. and J. Estes. Geographic Information Systems :An Introduction. Prentice Hall Englewood cliff, New Jersey, 1994.

Paper Name	Course Outcome	Critical Thinking:	Effective Communication:	Social Interaction:	Effective Citizenship:	Values and Ethics:	Environment and Sustainability:	Self-directed and Life-long Learning:
GIS AND ITS APPLICATION	CO402B.1		2		3	2	3	3
	CO402B.2	3		3	3	3	3	3
	CO402B.3	3	3	1	3	3	3	3
	Average	2	1.6	1	3	2.6	3	3

Special Paper (Group –B)
AERIAL PHTOGRAPHY, REMOTE SENSING, GPS AND GIS(100 Marks-5 Credits)

ELECTIVE COURSE EC-403
Course Objective:

To provide hands-on experience with remote sensing applications, including satellite image interpretation (both visual and digital), GPS surveys, and mapping techniques for land use, wetlands, and watershed delineation using DEMs . To develop proficiency in GIS applications, including spatial and non-spatial data management, GIS operations, map layouts, and the integration of remote sensing and GIS for thematic map creation and analysis.

Course Outcome:

CO403B.1 Appreciate the strength and application of remote sensing
CO403B.2 Map there sources, their location and availability
CO403B.3 Develop the skill so as to use digital satellite data using software
CO403B.4 Prepare the maps based with satellite data to compare with the ground realities
CO403B.5 Classify digital data for the land use/land cover and urban studies
CO403B.6 Apply GIS in various geographical.

Course Content:

Unit-I: Remote Sensing Applications: Satellite Image Interpretation (Visual Image Interpretation and Digital Image Interpretation),Identification of ground truth locations on satellite imagery, GPS survey Area mapping, road mapping. Digital image analysis technique (Supervised & Un-Supervised Classification) Mapping form satellite imagery- Land use/ Land cover, Wet land Mapping, Watershed Delineation through DEM, Terrain Evaluation (Elevation, Slope, Aspect etc),Estimation of Land Surface Temperature Bhavan –an Overview, Google Earth Application

Unit-II: Aerial Photography Applications :Testing of stereo vision ,Determination of Scale of Aerial photographs, Determination of object height on aerial photographs, Interpretation of stereo pair of aerial photographs Elements of image characteristics and interpretation of images, Mapping of landforms, Drainage, urban and rural settlements, agriculture and industry,

Unit-III: GIS Applications Spatial and Non -Spatial data management, Exercise of GIS software, Map

Layouts, designs and output generation, GIS single layer operations-clip, split ,dissolve, map join, buffering, overlay functions in GIS-union, intersection creation of thematic maps choropleth and dot methods charts, Integration of RS and GIS

References Books:

1. Campbell J. B., 2007: Introduction to Remote Sensing, Guildford Press.
2. Jensen J. R., 2004: Introductory Digital Image Processing: A Remote Sensing Perspective, Prentice Hall.
3. Joseph, G. 2005: Fundamentals of Remote Sensing, United Press India.
4. Lillesand T. M., Kiefer R. W. and Chipman J. W., 2004: Remote Sensing and Image Interpretation, Wiley. (Wiley Student Edition).
5. Nag P. and Kudra, M., 1998: Digital Remote Sensing, Concept, New Delhi.
6. Rees W. G., 2001: Physical Principles of Remote Sensing, Cambridge University Press.
7. Singh R. B. and Murai S., 1998: Space-informatics for Sustainable Development, Oxford and IBH Pub.
8. Wolf P. R. and Dewitt B. A., 2000: Elements of Photogrammetry: With Applications in GIS, McGrawHill.
9. Sarkar, A. (2015) Practical geography: A systematic approach. Orient Black Swan Private Ltd., New Delhi
10. Chauniyal, D.D. (2010) Sudur Samvedan evam Bhogolik Suchana Pranali, Sharda Pustak Bhawan, Allahabad

Paper Name	Course Outcome	Critical Thinking:	Effective Communication:	Social Interaction:	Effective Citizenship:	Values and Ethics:	Environment and Sustainability:	Self-directed and Life-long Learning:
		P01	P02	P03	P04	P05	P07	P08
AERIAL PHOTOGRAPHY REMOTE SENSING GPS AND GIS	CO403B.1	1	3		2	3	3	3
	CO403B.2	3	2	2	3	3	3	3
	CO403B.3	3	3	1	2	3	3	3
	CO403B.4	3	3	1	3	3	3	3
	CO403B.5	2	3		3	2	3	3
	CO403B.6		3	2	3	3	3	3
	Average	2	5.6	6	2.6	2.8	3	3

PROJECT REPORT(DISSERTATION) (100Marks-5Credits)
Core Course CC-404

Course Objective:

The students will be taught how to write a project report/dissertation.

Course Outcome:

CO404.1 While preparing their dissertation students will bead vised regularly by the Guides and will be submitting their collected data and analysis.

CO404.2 This dissertation will show a student's knowledge on research methodology and application.

Course Content:
The students will be taught how to write a project report/dissertation.

Paper Name	Course Outcome	Critical Thinking:	Effective Communication:	Social Interaction:	Effective Citizenship:	Values and Ethics:	Environment and Sustainability:	Self-directed and Life-long Learning:
		P01	P02	P03	P04	P05	P07	P08
DISSERTATION	CO404.1	3	3	3	3	3	3	3
	CO404.2	2	3	3	3	3	3	3
	Average	2.5	3	3	3	3	3	3

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