



Date :- 01/08/2023

NOTIFICATION

Sub :- CBCS Syllabi of B.A./B.Com./B.Sc. in Geography (Sem. I & II)

Ref. :- Decision of the Academic Council at its meeting held on 26/07/2023.

The Syllabi of B.A./B.Com./B.Sc. in Geography (First and Second Semesters) as per **NATIONAL EDUCATION POLICY - 2020** and approved by the Academic Council as referred above are hereby notified for implementation with effect from the academic year 2023-24.

Copy of the Syllabi Shall be downloaded from the College Website
(www.kcesmjcollege.in)

Sd/-
Chairman,
Board of Studies

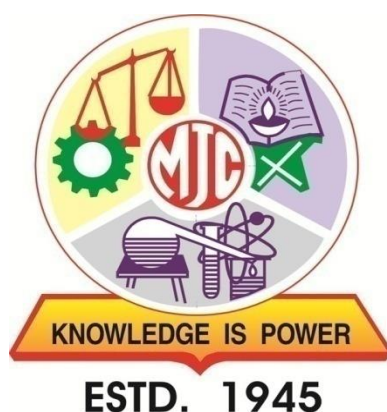
To :

- 1) The Head of the Dept., M. J. College, Jalgaon.
- 2) The office of the COE, M. J. College, Jalgaon.
- 3) The office of the Registrar, M. J. College, Jalgaon.

Knowledge is Power

Khandesh College Education Society's
Moolji Jaitha College, Jalgaon
An "Autonomous College"

Affiliated to
Kavayitri Bahinabai Chaudhari
North Maharashtra University, Jalgaon-425001



STRUCTURE AND SYLLABUS

B.Sc. Honours / Honours with Research (F.Y.B.Sc. Geography)

**Under Choice Based Credit System (CBCS)
and
as per NEP-2020 Guidelines**

[w.e.f. Academic Year: 2023-24]

Preface

Geography, as a subject, is an ancient discipline that explores the interactions between humans and their environment. Over the years, geography has evolved and incorporated various technological advancements, leading to significant developments in the field. One such noteworthy transformation has been the integration of Remote Sensing (RS), Geographic Information Systems (GIS), and Global Positioning System (GPS) technologies. These cutting-edge tools have revolutionized how geographers collect, analyze, and interpret spatial data, making geography an even more dynamic and relevant subject in contemporary times.

The Department of Geography at M. J. College (Autonomous), Jalgaon, is at the forefront of embracing these recent trends in geography. Through the courses offered, including B.A. Geography, B.Sc. Geography, M.A/M.Sc. Geography, and Ph.D., the department equips students with comprehensive knowledge and practical skills to navigate the complexities of modern geography. Additionally, the Certificate Course in Geoinformatics serves as a valuable platform for students to delve deeper into the applications of RS, GIS, and GPS technologies.

One of the standout characteristics of the Department is its team of expert and qualified faculties. These educators not only possess extensive academic knowledge but also have hands-on experience in utilizing geospatial technologies effectively. Their guidance empowers students to explore and understand the intricacies of geographical phenomena using the latest tools and methodologies.

The Department boasts state-of-the-art facilities, including smart laboratories for practicals, a central library supplemented with a departmental library, and a well-equipped GIS computer lab with internet access. The availability of these resources ensures that students have ample opportunities to engage in hands-on learning and conduct research, contributing to a comprehensive understanding of geographic concepts. Moreover, the Department has been recognized as a research center for Ph.D. studies, encouraging scholarly pursuits in the realm of geography. This designation highlights the institution's commitment to pushing the boundaries of geographical knowledge and fostering innovative research in the field. The integration of technology in geography education is further augmented by the presence of smart classrooms and advanced geographical instruments. These resources enable interactive learning and support students in developing a deep appreciation for the spatial dimensions of various phenomena.

In addition to academic excellence, the Department is devoted to providing specialized coaching for national-level exams such as NET/SET and competitive examinations. This emphasis on exam preparation equips students with the necessary skills to excel in their careers and become leading professionals in the field of geography. The collaboration with the Indian Institute of Remote Sensing (IIRS) as an Outreach Training Program center is a testament to the Department's commitment to keeping abreast of the latest advancements in geospatial technology. This association allows students and faculties to participate in training programs conducted by experts in the field, enhancing their knowledge and skills in RS, GIS, and GPS applications. Furthermore, the Department of Geography at M. J. College (Autonomous), Jalgaon, proudly boasts access to the best telescopes for sky watching. This unique feature provides students with an opportunity to explore celestial phenomena and their connections with the Earth, bridging the gap between the terrestrial and astronomical realms.

Finally, the Department's focus on career opportunities in geography ensures that graduates are well-prepared to enter various professional fields. The interdisciplinary nature of geography opens doors to careers in environmental management, urban planning, disaster management, cartography, geospatial analysis, and more. The versatility of geography as a subject makes it a rewarding and promising choice for students seeking diverse and impactful career paths.

The Department of Geography at M. J. College (Autonomous), Jalgaon, stands as a vibrant and progressive hub for geography education. The integration of RS, GIS, and GPS technologies, coupled

with expert faculty, modern facilities, and extensive research opportunities, equips students to become adept geographers, ready to address the pressing challenges of our ever-changing world.

Program Outcomes (PO) for B.Sc. Program:

Program outcomes associated with a B.Sc. degree are as follows:

PO No.	PO
PO1	Graduates should have a comprehensive knowledge and understanding of the fundamental principles, theories, and concepts in their chosen field of study.
PO2	Graduates should possess the necessary technical skills and competencies related to their discipline, including laboratory techniques and data analysis.
PO 3	Graduates should be able to identify, analyze, and solve complex problems using logical and critical thinking skills. They should be able to apply scientific methods and principles to investigate and find solutions.
PO4	Graduates should be proficient in effectively communicating scientific information, both orally and in writing.
PO 5	Graduates should have a basic foundation in research methods and be capable of designing and conducting scientific investigations.
PO 6	Graduates should be able to work effectively as part of a team, demonstrating the ability to collaborate with others, respect diverse perspectives, and contribute to group projects.
PO 7	Graduates should recognize the importance of ongoing learning and professional development. They should be equipped with the skills and motivation to engage in continuous learning, adapt to new technologies and advancements in their field, and stay updated with current research.

Program Specific Outcome PSO (B.Sc. Geography):

After completion of this course, students are expected to learn/understand the:

PO No.	PSO
PSO1	Geographical terms, concepts, and theories and will be able to explain and find out the relation between geographical factors and processes.
PSO2	Develop and prepare various thematic maps and map reading skills.
PSO 3	How their life is related to different geographical factors such as environmental, economic, social, and cultural at the local and global scale. He/she will be able to evaluate factors such as environmental, economic, social, and cultural, with respect to spatial dimensions from a local to global scale.
PSO 4	Interpretation of thematic maps through visual and/or digital interpretation of topographic maps, weather maps, aerial photographs, and satellite images.
PSO 5	Remote sensing concepts, and techniques in various fields of earth and environment sciences.
PSO 6	Geographical distribution of the global human population and factors affecting human populations including human settlement and economic activities and transport networks. The students will be able to understand the impacts of human activities on the physical environment.

Credit distribution structure for Three/ Four year Honors/ Honors with Research Degree Programme with Multiple Entry and Exit

Credit distribution structure for Three/ Four year Honors/ Honors with Research Degree Programme with Multiple Entry and Exit										
Level 1	Sem	Major (Core) Subjects		Minor Subjects (MIN)	GE/ OE	VSC, SEC (VSEC)	AEC, VEC, IKS	CC, FP, CEP, OJT/Int, RP	Cumulative Credits/Sem	Degree/ Cumulative Cr.
		Mandatory (DSC)	Elective (DSE)							
4.5	I	DSC-1 (2T) DSC-2 (2T) DSC-3 (2P)	—	MIN-1 (2T) MIN-2 (2P)	OE-1 (2T)	SEC-1 (2T) SEC-2 (1P)	AEC-1 (2T) (ENG) VEC-1 (2T) (ES) IKS (1T)	CC-1 (2)	22	UG Certificate 44
	II	DSC-4 (2T) DSC-5 (2T) DSC-6 (2P)	...	MIN-3 (2T) MIN-4 (2P)	OE-2 (2T)	SEC-3 (2T) SEC-4 (1P)	AEC-2 (2T) (ENG) VEC-2 (2T) (CI)	CC-2 (2)	22	
	Cum. Cr	12	...	8	4	6	4+4+2	4	44	
Exit option: Award of UG Certificate in Major with 44 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major and Minor.										
5.0	III	DSC-7 (2T) DSC-8 (2T) DSC-9 (2P) DSC-10 (2P)	...	MIN-5 (2T) MIN- 6 (2P)	OE-3 (2T) OE-4 (2P)		AEC-3 (2T) (MIL)	CC-3 (2) CEP (2)	22	UG Diploma 88
	IV	DSC-11 (2T) DSC-12 (2T) DSC-13 (2P) DSC-14 (2P)	...	MIN-7 (2T) MIN- 8 (2P)	OE- 5 (2T) OE-6 (2P)		AEC-4 (2T) (MIL)	CC-4 (2) FP (2)	22	
	Cum. Cr	28	...	16	10	6	8+4+2	8+2+2	88	
Exit option: Award of UG Diploma in Major and Minor with 88 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major and Minor.										
5.5	V	DSC-15 (2T) DSC-16 (2T) DSC-17 (2T) DSC-18 (2P) DSC-19 (2P)	DSE-1 (2T) A/B DSE-2 (2P) A/B	MIN-9 (2T/P)	...	VSC-1 (2T) VSC-2 (2P)	...	OJT/Int(2)	22	UG Degree 132
	VI	DSC-20 (2T) DSC-21 (2T) DSC-22 (2T) DSC-23 (2P) DSC-24 (2P)	DSE-3 (2T) A/B DSE-4 (2P) A/B	MIN-10(2T/P)	—	VSC-3 (2T) VSC-4 (2P)	...	OJT/Int(2)	22	
	Cum. Cr.	48	08	20	10	8+6	8+4+2	8+2+2+4	132	
Exit option: Award of UG Degree in Major with 132 credits OR Continue with Major and Minor										
6.0	VII	DSC-25 (4T) DSC-26 (4T) DSC-28 (4T) DSC-27 (2P)	DSE-5 (2T) A/B DSE-6(2P) A/B	RM (4T)	—	...	...		22	UG Honors Degree 176
	VIII	DSC-29 (4T) DSC-30 (4T) DSC-32 (4T) DSC-31 (2P)	DSE-7 (2T) A/B DSE-8(2P) A/B		—	...	...	OJT/Int (4)	22	
	Cum. Cr.	76	16	20+4	10	8+6	8+4+2	8+2+2+8	176	
Four Year UG Honors Degree in Major and Minor with 176 credits										
6.0	VII	DSC-25 (4T) DSC-26 (4T) DSC-27 (2P)	DSE-5 (2T) A/B DSE-6 (2P) A/B	RM (4T)	...	...	...	RP (4)	22	UG Honors with Research Degree 176
	VIII	DSC-29 (4T) DSC-30 (4T) DSC-31 (2P)	DSE-7 (2T) A/B DSE-8		...	...	...	RP (8)	22	
	Cum. Cr.	68	16	20+4	10	8+6	8+4+2	8+2+2+8+12	176	
Four Year UG Honours with Research Degree in Major and Minor with 176 credits										

Note: 2 credit course on Major Specific IKS shall be included under Major subject in FY or SY UG program

DSC : Department-Specific Core course, DSE : Department-Specific elective, GE/OE : Generic/ Open elective, SEC: Skill Enhancement Course; AEC : Ability Enhancement Course; VEC : Value Education Courses; ENG : English; ES: Environmental studies; CI : Constitution of India; IKS : Indian Knowledge System; CC: Co-curricular course; T: Theory; P: Practical; VSEC: Vocational and Skill Enhancement Courses; FP: Field project; MIL: Modern Indian Language

Multiple Entry and Multiple Exit options:

The multiple entry and exit options with the award of UG certificate/ UG diploma/ or three-year degree depending upon the number of credits secured;

Levels	Qualification Title	Credit Requirements		Semester	Year
		Minimum	Maximum		
4.5	UG Certificate	40	44	2	1
5.0	UG Diploma	80	88	4	2
5.5	Three Year Bachelor's Degree	120	132	6	3
6.0	Bachelor's Degree- Honours Or Bachelor's Degree- Honours with Research	160	176	8	4

F. Y. B. Sc. Geography Course Structure

Semester	Course Module	Credit	Hours/ week	TH/ PR	Code	Title
I	DSC	2	2	TH	GEO-DSC-111	Introduction to Lithosphere
	DSC	2	2	TH	GEO-DSC-112	Geography of Maharashtra
	DSC	2	4	PR	GEO-DSC-113	Scale and Diagram
	MIN	2	2	TH	GEO-MIN-111	General Cartography
	MIN	2	4	PR	GEO-MIN-112	Practicals in Cartography
	OE/GE	2	2	TH	GEO-GE-111	Sky Observation and Solar System
	SEC	2	2	TH	GEO-SEC-111	Water Harvesting
	SEC	1	2	PR	GEO-SEC-112	Assessment of Roof water Harvesting
	AEC	2	2	TH	ENGS-AEC-111	English
	VEC	2	2	TH	ES -VEC-111	Environmental studies
	IKS	1	1	TH	IKS-111	Indian knowledge system
	CC	2	2	CC	NCC-CC-111 NSS-CC-111 SPT-CC-111 CUL-CC-111	NCC NSS Sports Cultural
II	DSC	2	2	TH	GEO-DSC-121	Fundamentals of Atmosphere
	DSC	2	2	TH	GEO-DSC-122	Physical Geography of India
	DSC	2	4	PR	GEO-DSC-123	Earth's Projection
	MIN	2	2	TH	GEO-MIN-121	Green Audit
	MIN	2	4	PR	GEO-MIN-122	Practicals in Green Audit
	OE/GE	2	2	TH	GEO-GOE-121	Air Pollution
	SEC	2	2	TH	GEO-SEC-121	Principles of GPS
	SEC	1	2	PR	GEO-SEC-122	Applications of GPS
	AEC	2	2	TH	ENGS-AEC-121	English
	VEC	2	2	TH	CI-VEC-121	Constitution of India
	IKS	1	1	TH	IKS-121	Indian knowledge system
	CC	2	2	CC	NCC-CC-121 NSS-CC-121 SPT-CC-121 CUL-CC-121	NCC NSS Sports Cultural

DSC : Department-Specific Core course
DSE : Department-Specific elective
GE/OE : Generic/ Open elective
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MIN : Minor course
AEC : Ability Enhancement Course
VEC : Value Education Courses

ENG : English
ES : Environmental studies
CI : Constitution of India
IKS : Indian Knowledge System
CC : Co-curricular course
TH : Theory
PR : Practical

Examination Pattern

Theory Question Paper Pattern:

- 30 (External) +20 (Internal) for 2 credits
 - External examination will be of 1½ hours duration
 - There shall be 3 questions Q1 carrying 6 marks and Q2, Q3 carrying 12 marks each. while the tentative pattern of question papers shall be as follows;
 - Q1 Attempt any 2 out of 3 sub-questions; each 3 marks
 - Q 2 and Q3 Attempt any 3 out of 4 sub-question; each 4 marks.

Rules of Continuous Internal Evaluation:

The Continuous Internal Evaluation for theory papers shall consist of two methods:

1. Continuous & Comprehensive Evaluation (CCE): CCE will carry a maximum of 30% weightage (30/15 marks) of the total marks for a course. Before the start of the academic session in each semester, the subject teacher should choose any three assessment methods from the following list, with each method carrying 10/5 marks:

- i. Individual Assignments
- ii. Seminars/Classroom Presentations/Quizzes
- iii. Group Discussions/Class Discussion/Group Assignments
- iv. Case studies/Case lets
- v. Participatory & Industry-Integrated Learning/Field visits
- vi. Practical activities/Problem Solving Exercises
- vii. Participation in Seminars/Academic Events/Symposia, etc.
- viii. Mini Projects/Capstone Projects
- ix. Book review/Article review/Article preparation
- x. Any other academic activity
- xi. Each chosen CCE method shall be based on a particular unit of the syllabus, ensuring that three units of the syllabus are mapped to the CCEs.

2. Internal Assessment Tests (IAT): IAT will carry a maximum of 10% weightage (10/5 marks) of the total marks for a course. IAT shall be conducted at the end of the semester and will assess the remaining unit of the syllabus that was not covered by the CCEs. The subject teacher is at liberty to decide which units are to be assessed using CCEs and which unit is to be assessed on the basis of IAT. The overall weightage of Continuous Internal Evaluation (CCE + IAT) shall be 40% of the total marks for the course. The remaining 60% of the marks shall be allocated to the semester-end examinations. The subject teachers are required to communicate the chosen CCE methods and the corresponding syllabus units to the students at the beginning of the semester to ensure clarity and proper preparation.

Practical Examination Credit 2: Pattern (30+20)

External Practical Examination (30 marks):

- Practical examination shall be conducted by the respective department at the end of the semester.
- Practical examination will be of 3 hours duration and shall be conducted as per schedule.

- Practical examination shall be conducted for 2 consecutive days for 2 hr/ day where incubation condition is required.
- There shall be 05 marks for journal and viva-voce. Certified journal is compulsory to appear for practical examination.
- External practical examination of SEC will be of 25 marks and there will be no internal exam for SEC practical.

Internal Practical Examination (20 marks):

- Internal practical examination of 10 marks will be conducted by department as per schedule given.
- For internal practical examination student must produce the laboratory journal of practicals completed along with the completion certificate signed by the concerned teacher and the Head of the department.
- There shall be continuous assessment of 30 marks based on student performance throughout the semester. This assessment can include quizzes, group discussions, presentations and other activities assigned by the faculty during regular practicals. For details refer internal theory examination guidelines.
- Finally 40 (10+30) marks performance of student will be converted into 20 marks.

SEMESTER - I

F.Y.B.Sc.
Semester I
GEO-DSC111: Introduction to Lithosphere

Total Hours: 30

Credits: 2

Learning objectives	- To understand lithosphere and distribution of oceans and continents. - To explore theories explaining land and water distribution. - To Comprehend Earth's interior structure and characteristics of rocks. - To Study earthquakes, volcanoes, weathering processes, and landforms.	
Course outcomes	After successful completion of this course, students are expected to: - Will understand Earth's land and water distribution - Develop a comprehensive understanding of the lithosphere, its distribution, and theories explaining land distribution. - Acquire comprehension of Earth's interior structure and rocks. - Understand earthquakes, volcanoes, weathering, and landforms development process.	
Unit	Topic Particular	Hours
Unit I	Introduction to the Lithosphere - Meaning and Definition of lithosphere - Introduction to Earth System - Distribution of Oceans and Continents & its Salient Features - Theories Regarding the Present Distribution of Land & Water - Continental Drift Theory - Plate Tectonics Theory	8
Unit II	Interior Structure and Rocks - Introduction - Interior Structure and Composition of the Earth - Meaning and Definition of Rocks - Types of rocks: Igneous, Sedimentary, and Metamorphic rocks - Characteristics of rocks	6
Unit III	Earthquakes and Volcanoes - Earthquakes: - Definition - Causes and Effects - Volcanoes - Definition - Causes, Effects and Types	8
Unit IV	Weathering and Landforms - Weathering - Definition - Factors - Types - Landforms - Process of Landforms - Erosional and Depositional Landforms by River and Wind	8

Study Resources	• Christopherson, R. W. (2015). Geosystems: An Introduction to Physical Geography (9th ed.). • Montgomery, C. W. (2014). Environmental Geology: The Science Behind the Stories (5th ed.). • Tarbuck, E. J., Lutgens, F. K., & Tasa, D. G. (2014). Earth: An Introduction to Physical Geology (11th ed.). • Marshak, S. (2014). Earth: Portrait of a Planet (5th ed.). • Strahler, A. N., & Strahler, A. H. (2011). Introducing Physical Geography (6th ed.). • Skinner, B. J., Porter, S. C., & Botkin, D. B. (2017). The Blue Planet: An Introduction to Earth System Science (3rd ed.). • Press, F., Siever, R., Grotzinger, J., & Jordan, T. (2003). Understanding Earth (4th ed.). • Bennett, M. R., & Doyle, P. (2014). Geology Today: An Introduction to Earth Science (2nd ed.). • Prothero, D. R., & Schwab, F. (2013). Sedimentary Geology: An Introduction to Sedimentary Rocks and Stratigraphy (3rd ed.). • Plummer, C. C., Carlson, D. H., & Hammersley, L. (2015). Physical Geology (15th ed.).
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**F.Y.B.Sc.
Semester I
GEO- DSC-112: Geography of Maharashtra**

Total Hours: 30

Credits: 2

Learning objectives	• To acquaint the student with basic knowledge of Maharashtra state. • To understand administrative and physiographic distribution. • To provide knowledge with resources and industrial distribution • To acquaint the student with problems and prospects of Maharashtra.	
Course outcomes	After successful completion of this course, students are expected to: • Familiar with prospective of Maharashtra. • Familiar with administrative and physiographic distribution. • Enhance his knowledge with resources and industries of Maharashtra • Enhance his knowledge for doing research on Maharashtra's problem and futuristic development plan for Maharashtra	
Unit	Topic Particular	Hours
Unit I	Introduction • Introduction to geography as a discipline and its relevance to Maharashtra Historical Background • Location, Extend and Boundaries • Study of the political geography of Maharashtra, including administrative divisions, major cities, and districts • Geological setup	8
Unit II	Physiography and Drainage • Major physiographic Division of Maharashtra-	6

	○ Konkan ○ Maharashtra Plateau ○ Western Ghat ○ Other Hilly Ranges ● Major Rivers of Maharashtra and their tributaries ○ Konkan Rivers ○ Plateau Rivers	
Unit III	Climate, Soil and Natural Vegetation ● Climate of Maharashtra ● Soils ● Natural Vegetation ● Wildlife Sanctuaries ● Agricultural patterns and cropping systems	8
Unit IV	Minerals Resource and Industries ● Introduction ○ Production and Distribution of Minerals ○ Iron ore ○ Bauxite ○ Coal ● Industries ○ Cotton Textile ○ Sugar ○ Tourism	8
Study Resources	● Tirtha, Ranjit. (2002): Geography of India, Rawat, Jaipur. ● Tata McGraw Atlas: Socio Economic Atlas of India. ● Hussain, Majid. (2014): Geography of India, McGraw Hill Education (India) Private education, New Delhi. ● Bhamare, S. M. (2013): Geography of Maharashtra, Prashant Publication, Jalgaon. ● Memoria, C. B. (1986): Geography of India, Shivalal Agrawal and Co., Agra ● Sharma, and Coutinho. (1998): Economic and Commercial Geography of India. Vikas Publishing House, India.	

F.Y.B.Sc.
Semester I
GEO- DSC-113: Scale and Diagrams

Total Hours: 60

Credits: 2

Learning Objectives	● To introduce the basic elements of map making. ● Introduce the student about actual earth surface and map relation. ● To understand the appropriate method for data representation ● To introduce climatic data and representation of data
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Course Outcomes	After successful completion of this course, students are expected to: • Understand the basic elements of map making • Understand Earth surface and map relation. • Have capability to data analysis • Know the climatic data and data interpretation.	
Sr. No.	Topic Particular	Hours
1	Concept and identification of scale	4
2	Methods of measurement and type of scale	4
3	Representing of Verbal scale	4
4	Representing of Numerical scale	4
5	Representing of Graphical scale	4
6	Conversion of scale (British and Metric system)	4
7	Construction of scales Simple Graphical scale Time and Distance Scale (Only Metric System)	4
8	Identification Collection and arrangement of geographic data	4
9	Construction of Simple Line Graph Construction of Bar Graph	4
10	Construction of Combine Graph (Line & Bar Graph)	4
11	Construction of Climograph Merit and Demerits of graphs	4
12	Construction of the statistical Diagrams Wind Rose Divided Circle Proportional Circle	4
13	Meaning of Distributional Maps Types of Distribution Maps	4
14	Prepare of Dot Maps prepare of Choropleth Maps	4
15	prepare of Isopleth Maps Advantages & disadvantages of Distribution Maps	4
Study Resources	• Balbir Singh Negi: Practical Geography, Kedarnath Ramnath Publishers, Meerut Delhi. • Gopal Singh: Map Work and Practical Geography, Vikas Publishing House Pvt. Ltd., • Mishra R. P. & Ramesh A.: Fundamental of Cartography, McMillan Co., New • Monkhouse F. J. & Wilkusion H. R.: Maps and Diagram, Methuen & Co. Ltd. London. New Delhi. • Pal, S.K. Statistics for Geoscientists — Techniques and Applications, Concept, New • Robert H. & Patrick M.: Quantitative Techniques in Geography, Oxford University Press. • Robinson, A.H. et al.: Elements of Cartography, John Wiley & Sons, U.S.A. • Sarkar A.K Practical Geography: A Systematic Approach, Oriental Longman,	

	Calcutta. • Singh, R.L. and Dutt, P.K.: Elements of Practical Geography, Kalyani Publishers, New Delhi. • Singh L. R.: Fundamentals of Practical Geography, Sharda Pustak Bhavan, Allahabad.
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F.Y.B.Sc.
Semester I
GEO-MIN-111: General Cartography

Total Hours: 30

Credits: 2

Learning objectives	- To acquaint the students with cartographic Techniques. - To study importance of scale and imaginary distribution of Erath. - To understand the Erath spherical shape and structure and impact - To understand Purpose and Classification of map	
Course outcomes	After successful completion of this course, students are expected to: - Develop the uses of cartographic Techniques. - Understand importance of scale and imaginary distribution of Erath in map making - Knowledge with spherical shape and structure and impact on location of Erath - Understand importance implementation in map.	
Unit	Topic Particular	Hours
Unit I	- Introduction to cartography, Nature and scope of cartography - History and development of Cartography - Elements of cartography	8
Unit II	- Determination of latitude, longitude and azimuth of celestial bodies - Scales: Types, significance and applications - Coordinate systems: Polar and rectangular. - Bearing: Magnetic and true whole-circle and reduced	8
Unit III	- Geoid, Spheroid, Ellipsoid, Datam, M.S.L - Map projections: Classification, properties and uses - Concept and significance of UTM projection	6
Unit IV	Maps: Purpose and Classification of map- according to scale, according to amount of topographic details, according to purpose, according to style of construction	8
Study Resources	- Anson, R. W. and Ormeling, F. J., (Ed.) (1993): Basic Cartography for Students and - Dickinson, G. C. (1977) Statistical Mapping and the Presentation of Statistics, Edward Arnold Ltd., London. - Hodgkiss, A. G. (1970): Maps for Books and Theses, David and Charles Publishers Ltd., London. - Misra R. P. and A. Ramesh, (1969): Fundamentals of Cartography, Prasaranga, University of Mysore. - Monkhouse, F. J. and H. R. Wilkinson, (1971): Maps and Diagrams, Methuen	

	& Co. Ltd., London. • Robinson, A. H. and Others (1995): Elements of Cartography, VI Edition, John Wiley & Sons, New York. • Technicians, Vol.I, International Cartographic Association and Elsevier Applied Science Publishers, London.
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F.Y.B.Sc.
Semester I
GEO-MIN-112: Practicals in Cartography

Total Hours: 60

Credits: 2

Learning Objectives	- To acquaint the students with cartographic Techniques. - To study importance of scale in map making. - To study various map making tools and techniques. - To understand Geographical data for map making	
Course Outcomes	After successful completion of this course, students are expected to: - Uses of cartographic Techniques. - Understand importance implementation in map. - Able to handle map making tools and techniques - Able to prepare maps	
Sr. No.	Topic Particular	Hours
1	Concept and identification of scale	4
2	Methods of measurement and type of scale	4
3	Representing of Verbal scale	4
4	Representing of Numerical scale	4
5	Representing of Graphical scale	4
6	Definition of Map and Globe Coordinates Major Latitudes and Longitude	4
7	Elements of map	4
8	Introduction to Map Projection Construction of projections: Zenithal Polar Gnomonic projection	4
9	Construction of projections: Cylindrical Equal Area	4
10	Construction of projections: Mercator's Projection	4
11	Construction of projections: Sinusoidal Projection	4
12	Meaning of Distributional Maps Types of Distribution Maps	4
13	Prepare of Dot Maps Prepare of Choropleth Maps	4

14	Prepare of Isopleth Maps	4
15	Advantages & disadvantages of Distribution Maps	4
Study Resources	- Anson, R. W. and Ormeling, F. J., (Ed.) (1993): Basic Cartography for Students and - Dickinson, G. C. (1977) Statistical Mapping and the Presentation of Statistics, Edward Arnold Ltd., London. - Hodgkiss, A. G. (1970): Maps for Books and Theses, David and Charles Publishers Ltd., London. - Misra R. P. and A. Ramesh, (1969): Fundamentals of Cartography, Prasaranga, University of Mysore. - Monkhouse, F. J. and H. R. Wilkinson, (1971): Maps and Diagrams, Methuen & Co. Ltd., London. - Robinson, A. H. and Others (1995): Elements of Cartography, VI Edition, John Wiley & Sons, New York. - Technicians, Vol.I, International Cartographic Association and Elsevier Applied Science Publishers, London.	

F.Y.B.Sc.
Semester I
GEO-GE-111: Sky Observation and Solar System

Total Hours: 30

Credits: 2

Learning objectives	- To introduce about our galaxy. - To introduce orbit system. - To introduce recent techniques & methods for study of sky observation - To give awareness with sky observation telescope	
Course outcomes	After successful completion of this course, students are expected to: - Familiar with our galaxy. - Will know how orbit system. - Knowledge with recent techniques & methods for study of sky observation - To give awareness with sky observation telescope	
Unit	Topic Particular	Hours
Unit I	Introduction - Definition and concept of Galaxy - Introduction: Solar System - Sun	8
Unit II	Origin of Solar System - Early scientific theories - Nebular Hypothesis of Kant and Laplace - Planetesimal Hypothesis of Chamberlin and Moulton - Big Bang theory of George Lamaitre	6
Unit III	Composition of The Solar System - Star, Orbits, Planets and their Moon. - Asteroids and Comets. - Interplanetary medium.	8

Unit IV	Recent Techniques & Methods for study • Mobile Application • Computer Software • Advanced Telescope • Skylab	8
Study Resources	• Dickinson, T., & Dyer, A. (2016). The Backyard Astronomer's Guide (3rd ed.). Firefly Books. • Pasachoff, J. M., & Kutner, M. L. (2017). The Cambridge Guide to the Solar System (2nd ed.). Cambridge University Press. • Cox, B. (2015). Wonders of the Universe. HarperCollins Publishers. • Aguilar, D. A. (Ed.). (2017). The International Atlas of Mars Exploration: Volume 2, 2004 to 2014: From Spirit to Curiosity. Cambridge University Press. • Rothery, D. A. (2015). Mercury. Springer Praxis Books. • Baker, D. (2017). The Science of Astronomy and Space. Chelsea House Publishers. • Sinclair, I. (2018). The Complete Guide to the Universe: From the Discovery of the Solar System to Exoplanets, Galaxies, and Beyond. Princeton University Press. • Bell, J. F., & Porco, C. (Eds.). (2016). The Saturn System: Through the Eyes of Cassini. University of Arizona Press. • Beatty, J. K., Petersen, C. C., & Chaikin, A. (2016). The New Solar System (4th ed.). Cambridge University Press. • Moore, P., & Tirion, W. (2016). Astronomy: A Complete Introduction. Teach Yourself.	

F.Y.B.Sc.
Semester I
GEO-SEC-111: Water Harvesting

Total Hours: 30

Credits: 2

Learning Objectives	• To understand the rainwater harvesting concepts, terms, and principles. • Student able to assess a site for rainwater harvesting potential and water uses. • To design a conceptual integrated rainwater harvesting plan for a site. • To understand the various applications of RS and GIS in water harvesting.	
Course outcomes	After successful completion of this course, students are expected to: • Aware of rainwater harvesting concepts and terms. • Understand rainwater harvesting principles. • Assess a site for rainwater harvesting potential and water uses. • Able to use RS and GIS techniques for water harvesting.	
Unit	Topic Particular	Hours
Unit I	Water Harvesting • Introduction to water harvesting • Over-exploitation of groundwater • History of water harvesting • Need for artificial recharge and rainwater harvesting	8

	Factors influencing the water harvesting system	
Unit II	Rainwater Harvesting - Watershed Management for rainwater harvesting - Major Sources for rainwater harvesting - Rainwater harvesting and the environment - Advantages of rainwater harvesting - Disadvantages of rainwater harvesting	8
Unit III	Estimation and Benefits of Water Harvesting Structures - Estimation of probable runoff from an area including from roof tops. - Maintenance and monitoring of RWH structures. - Study of benefits – effects on local groundwater environments – remedial measures. - Recycling of domestic water - sources of water for recharge in urban areas.	6
Unit IV	Methods of Water Harvesting: - Methods of water harvesting: - Various artificial recharge structures: recharge ponds - recharge pits - percolation ponds - basin spreading - surface and subsurface dykes - recharge wells - recharge borewells. - Rainwater harvesting in urban areas: RWH structures - design - construction. - Precautions for source, construction and establishing RWH structures - Applications of Remote Sensing and GIS in Rainwater Harvesting - A Case Study of: - Water Harvesting System to Reduce Climate Change - Water Harvesting for Sustainable Water Resource Management	8
Study Resources	- Critchley, W. and Siegert, K. (1991). A Manual for the Design and Construction of Water Harvesting Schemes for Plant Production, Food and Agricultural organization. - Davis, S.N. and De Wiest, R.J.M, (1966). Hydrogeology, John Wiley and Sons, US. - Owesis, T. Y., Prinz, D. and Hachum, A. Y. (2012). Rainwater harvesting for agriculture in the dry areas. CRC Press publication. R. Allan Freeze and John A Cherry, 1979. Groundwater, Prentice w-Hall, Inc., Englewood Cliffs, NJ 07632, US. - Rainwater Harvesting Techniques to augment Groundwater, 2003. Ministry of Water Resources, Central Groundwater Board, Faridabad, India. - S.SankaraPitthaiah, 1995. Groundwater, Scientific Publishers, Jodhpur, India. - Singh, V. K.(2021) Rainwater Harvesting KS Omni Scriptum Publishing, London, UK - Tiwari, K.N. and Saxena, A. K. (1987). Dry spell and wet spell analysis with reference to the water harvesting- a case study – IV. Indian J. of Power and	

	River Valley Dev., (Nov-Dec.): 295-301. • Water Management in Urban Areas, 2003, Proceedings of Training of Trainers, Central Groundwater Board, Chennai, India. • Water Resource and Water Quality Management for Sustainable Drinking Water Supply, 2001. proceedings published by the Tamil Nadu Water and Drainage Board, Chennai, India.
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F.Y.B.Sc.
Semester I
GEO-SEC-112: Assessment of Roof water Harvesting

Total Hours: 30

Credits: 1

Learning Objectives	• To understand the suitable site selection for rainwater harvesting • Student able to calculate rainwater runoff volumes from different areas and surfaces • To design a most effective water harvesting strategies for locations on a design site • To assess the Rooftop rainwater harvesting potential using RS and GIS techniques	
Course Outcomes	After successful completion of this course, students are expected to: • Able to calculate area, perimeter and runoff coefficient for water harvesting. • Understand potential rainwater resources. • Assess a site for rainwater harvesting collection and distribution system. • Assessment of Rooftop rainwater harvesting potential using RS and GIS techniques	
Sr. No.	Topic Particular	Hours
1	• Analyze a map to identify the watershed of a site using Toposheet. • Area and perimeter calculations • Identify the runoff coefficient from different surfaces. • Identify water entry and exit points on a site.	06
2	• Rainfall data collection methods • Calculate rainwater runoff volumes from different areas and surfaces. • Calculate interior water uses. • Identify rainwater harvesting resource opportunities on a design site.	06
3	• Determine the most effective water harvesting strategies for locations on a design site. • Calculate potential rainwater resources for specific locations. • Design rainwater harvesting collection and distribution system. • Size rainwater flow features throughout the design.	10

	• Comprehend the potential community impacts of rainwater harvesting design.	
4	• Assessment of Rooftop rainwater harvesting potential using RS and GIS techniques	08
Study Resources	• Abdulla, F. & Al-Shareef, A. (2009). Roof rainwater harvesting systems for household water supply in Jordan. Desalination. 243, 195–207 • Davis, S.N. and De Wiest, R.J.M, (1966). Hydrogeology, John Wiley and Sons, US. • Hari, D. 2019. Estimation of Rooftop Rainwater Harvesting Potential using Applications of Google Earth Pro and GIS. International Journal of Innovative Technology and Exploring Engineering, 8(9): 2278–3075. • Gould, J. & Nissen-Petersen, E. (1999). Rainwater catchment systems for domestic supply: design, construction, and implementation. Intermediate Technology Publications, London, UK • R. Allan Freeze and John A Cherry, 1979. Groundwater, Prentice w-Hall, Inc., Englewood Cliffs, NJ 07632, US. • S.Sankara Pitchaiah, 1995. Groundwater, Scientific Publishers, Jodhpur, India. • Singh, V. K. (2021) Rainwater Harvesting KS Omni Scriptum Publishing, London, UK	

SEMESTER - II

F.Y.B.Sc.
Semester II
GEO-DSC-121: Fundamentals of Atmosphere

Total Hours: 30

Credits: 2

Learning objectives	- Understand the composition and structure of Earth's atmosphere. - Explain the concepts of insolation and their influence on temperature distribution. - Identify the factors affecting the distribution of insolation and temperature. - Describe the formation of pressure belts, the factors influencing wind patterns, and the classification of winds.	
Course outcomes	After successful completion of this course, students are expected to: - Analyze and interpret the characteristics of Earth's atmosphere and its components. - Evaluate the relationship between insolation, temperature, and the distribution of weather patterns. - Apply knowledge of atmospheric pressure and wind systems to explain global and regional climatic variations. - Assess the impact of humidity, precipitation, and rainfall patterns on various aspects of human activities.	
Unit	Topic Particular	Hours
Unit I	- Definitions of Atmosphere - Concept of Weather & Climate - Composition of Atmosphere - Gases, - Water Vapour - Dust Particles - Structure of Atmosphere	8
Unit II	- Concept of Insolation, Solar Constant and Albedo of the Earth - Distribution of Isolation- - Factors Affecting on distribution of Insolation - Distribution of Temperature- - Factors Affecting on distribution of Temperature.	6
Unit III	- Atmospheric Pressure - Formation of Pressure Belts - Winds - Factors Affecting on Wind - Pressure Gradient - Coriolis Force - Frictional Force - Classification of Winds - Planetary Winds - Periodical Winds - Monsoon Winds	8

Unit IV	- Definition & Types of Humidity - Absolute - Specific - Relative Humidity - Forms of Precipitation: Rain, Drizzle, Snow, Sleet - Types of Rainfall - Applications of Climatology in the field of– Agriculture, Settlement, Health, Trade and Transport	8
Study Resources	- Ahrens, C. D. (2018). Essentials of meteorology: An invitation to the atmosphere. Cengage Learning. - Ahrens, C. D. (2019). Meteorology today: An introduction to weather, climate, and the environment. Cengage Learning. - Barry, R. G., & Chorley, R. J. (2009). Atmosphere, weather and climate. Routledge. - Houghton, J. T., Ding, Y., Griggs, D. J., Noguer, M., van der Linden, P. J., Dai, X., ... & Maskell, K. (Eds.). (2001). Climate change 2001: The scientific basis (Vol. 1). Cambridge University Press. - Lal, D. S. (2021). Climatology. Sharda Pustak Bhawan Publication. Allahabad. - Lutgens, F. K., Tarbuck, E. J., & Tasa, D. (2020). The atmosphere: An introduction to meteorology. Pearson. - Peixoto, J. P., & Oort, A. H. (1992). Physics of climate. American Institute of Physics. - Singh, R. B., & Ghosh, S. K. (Eds.). (2019). Climate change and its impact on agriculture. CRC Press. - Singh, Savindra. (2022). Climatology. Pravalika publications, Prayagraj. - Spicer, T. (2014). Environmental monitoring and characterization. Academic Press. - Trenberth, K. E. (2010). Atmospheric moisture residence times and cycling: Implications for rainfall rates with climate change. Climate change, 2, 125-133. - Wallace, J. M., & Hobbs, P. V. (2006). Atmospheric science: An introductory survey (2nd ed.). Academic Press.	

**F.Y.B.Sc.
Semester II
GEO-DSC-122: Physical Geography of India**

Total Hours: 30

Credits: 2

Learning objectives	- To understand the relationship of India and neighboring countries in the Indian knowledge system and modern history - To describe the location of India in terms of latitude and longitude - To describe the main characteristics of the major physiographic divisions - To give a description of the major relief features and rivers of India - To explain the concept of monsoon and its causes - To state the climatic conditions during different seasons
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Course outcomes	After successful completion of this course, students are expected to: • Aware of historical developments and contributions of various pioneers • How the subject emerges as a new branch of biology and its current scope • Know the diversity of microorganisms and differences among various microbes • Understand the rules applied for microbial taxonomy	
Unit	Topic Particular	Hours
Unit I	Geographical Personality of India • Historical Background • Introduction: Location, Extent and Geographical Area • Relationships with Adjacent Countries • Indian Ocean's Role in Global Geopolitics.	8
Unit II	Physical Division of India • Significant physiographic regions and their significance • The Northern Mountains • The North Indian Plains • The Peninsular Plateau • The Coastal Low Lands • The Islands	7
Unit III	Drainage • Drainage system of India ○ The Himalayan River system ○ The peninsular river system ○ East flowing rivers ○ West flowing rivers	8
Unit IV	Climate • Role of various controlling factors on climate of India • Indian seasons and weather • The origin and mechanism of monsoon	7
Study Resources	• Deshpande, C.D. (1992). India-A Regional Interpretation. Northern Book Centre, New Delhi. • Farmer, B.H. (1983). An Introduction to South Asia. Methuen, London. • Govt. of India. (1965). National Atlas of India, NATMO Publication, Calcutta. • Govt. of India. (1991). the Gazetteer of India. Vol I & III Publication Division, New Delhi. • Routray, J.K. (1993). Geography of Regional Disparity. Asian Institute of Technology, Bangkok. • Shafi, M. (2000). Geography of South Asia. McMillan & Co., Calcutta. • Singh, R.L. (ed.). (1971). India: A Regional Geography. National Geographical Society India, Varanasi. • P. G. Saptarshi, J. C. More, V. R. Ugale & A. H. Musmade. (2009). A Geographical Region of India. Diamond Publication (Marathi), Pune • Majid Husain (2008) Geography of India 3rd edition Tata Mac Grow- Hill Education Private Ltd, - New Delhi. • Khatib K.A. (2008) Geography of India, K'Sagar Publications, Pune. • Government of India (2015)	

F.Y.B.Sc.
Semester II
GEO-DSC-123: Earth's Projection

Total Hours: 60

Credits: 2

Learning Objectives	- To know the imaginary distribution of earth - To introduce the map projections. - To develop the map making skill. - To understand use of projection according to location	
Course Outcomes	After successful completion of this course, students are expected to: - Enhance knowledge with imaginary distribution of earth - Understand the methods of construction of various projections - Understand map making process using basic Projections. - Have capability to use appropriate projection according to location for map preparation	
Sr. No.	Topic Particular	Hours
1	- Definition of Map and Globe - Coordinates	4
2	Major Latitudes and Longitude	4
3	- Introduction to Map Projection - Classification of Map Projection based on their Development	4
4	- Perspective Projections - Non-Perspective Projections Conventional	4
5	Construction of projections: Zenithal projection: zenithal Polar Gnomonic projection	4
6	zenithal Polar Stereographic projection	4
7	Conical projection: Simple conical projection with one standard parallel	4
8	Simple conical projection with two standard parallel	4
9	Bonne's Projection	4
10	Cylindrical Projection: Cylindrical equal area Projection	4
11	Mercator's Projection	4
12	Construction of projections: Sinusoidal Projection, Mollweide's projection	4
13	Choice of Map projections	4
14	Usefulness of all projections. Problems with the choice of map projection	4
15	Choice of Map projections for different Purposes and Regions. Distortion (shape, size, direction, area)	4

Study Resources	- James Alfred Steers, An Introduction to the Study of Map Projections, University of London Press, - Erwin Raisz Elements of Cartography: 12. Elements of Practical Geography: Robinson A.H. & Sleep R.D. - Kellaway, G.P., 1979: Map Projections, B.I. Publications, New Delhi - Monkhouse, F.J. and Wilkinson, H.R. 1980: Maps and Diagrams - Singh, R.L. and Singh, R.P.B. 1992: Elements of practical Geography. - Steers, J.A.1954: An Introduction to the Study of Map Projections University of, New York. - R.Sing & Kanaujia : Map work and Practical Geography - R.C.Sing & Dutta : Elements of Practical Geography F. J. Mankhouse& H. R. Wilkinson : Map & Diagrams - Gopal Singh: Map work and Practical Geography - George Kallawy Map Projection: London Press, London. Publications Private Limited, New Delhi. 36.
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**F.Y.B.Sc.
Semester II
GEO-MIN-121: Green Audit**

Total Hours: 30

Credits: 2

Learning objectives	- Understand green audit's importance for environmental sustainability. - Learn the process of planning, conducting, and following up on green audits. - Comprehend the integration of green audit within Environmental Management Systems (EMS) and relevant standards. - Develop communication and reporting skills for effectively conveying green audit findings.	
Course outcomes	After successful completion of this course, students are expected to: - Understand the significance of green audit in organizational sustainability. - Students will be able to perform green audits by collecting, analyzing, and reporting data. - Students will acquire the green audit principles within EMS. Students will develop green audit results effectively to stakeholders and integrate them into CSR reporting.	
Unit	Topic Particular	Hours
Unit I	Introduction to Green Audit - Understanding the concept of green audit - Importance of green audit for organizations - Overview of environmental sustainability and its relevance to green audit - Environmental regulations and standards - Key stakeholders and their roles in green audit - Methods and tools used in green audit - Case studies illustrating the benefits of green audit	6

Unit II	Green Audit Process • Planning phase of green audit ○ Identifying audit objectives and scope ○ Developing an audit plan ○ Establishing audit criteria • Conducting the audit ○ Collecting and analyzing relevant data ○ Evaluating environmental performance ○ Identifying non-compliance and areas for improvement ○ Reporting and documenting audit findings • Follow-up phase of green audit ○ Corrective actions and continuous improvement ○ Monitoring and verification of improvements ○ Communication of audit results to stakeholders	8
Unit III	Environmental Management Systems (EMS) and Green Audit • Overview of Environmental Management Systems (EMS) • Integration of green audit within an EMS framework • ISO 14001:2015 standard and its relevance to green audit • Auditing environmental management systems • Identifying environmental aspects and impacts • Evaluating compliance with legal and regulatory requirements • Evaluating the effectiveness of environmental management programs	8
Unit IV	Reporting and Communication in Green Audit • Reporting requirements for green audit • Green audit report structure and content • Communication strategies for audit findings • Engaging stakeholders in green audit results • Internal and external communication channels • Sustainability reporting frameworks (e.g., GRI, CDP) • Integrating green audit results into corporate social responsibility (CSR) reporting	8
Study Resources	• Environmental Protection Agency. (2020). Introduction to Environmental Auditing. Retrieved from https://www.epa.gov/compliance/introduction-environmental-auditing • CDP. (2021). CDP Reporting Guidance: How to disclose your climate, water, and deforestation impacts. Retrieved from https://www.cdp.net/en/guidance/guidance-for-disclosing • Darnall, N., Ji, H., & Potoski, M. (2019). The growing demand for corporate sustainability: Drivers and consequences. <i>Journal of Management Studies</i>, 56(1), 50-79. • Global Reporting Initiative. (2018). Sustainability Reporting Standards: The global standard for sustainability reporting. Retrieved from https://www.globalreporting.org/standards/ • Gurnani, H., & Allam, R. (2019). Green audit: an overview of concepts and practices. <i>Journal of Cleaner Production</i>, 234, 356-369. • International Organization for Standardization. (2015). ISO 14001:2015 Environmental management systems - Requirements with guidance for use.	

	Geneva, Switzerland: ISO. • Kazemi, A., & Gharneh, N. G. (2017). Environmental Audit: Concepts, Types, Benefits, and Challenges. <i>Procedia Engineering</i>, 180, 1597-1606. • Schaltegger, S., Burritt, R., & Petersen, H. (2017). <i>An Introduction to Corporate Environmental Management: Striving for Sustainability</i>. London, UK: Routledge. • Stentoft, J., & Eskildsen, J. K. (2019). Green Auditing in Supply Chains: A systematic literature review. <i>International Journal of Operations & Production Management</i>, 39(5), 643-674. • Welford, R. (2013). <i>Corporate Environmental Management 3: Towards Sustainable Development</i>. London, UK: Routledge.
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F.Y.B.Sc.
Semester II
GEO-MI-122: Practicals in Green Audit

Total Hours: 60

Credits: 2

Learning Objectives	• Acquire practical skills in conducting green audits and reporting environmental data. • Familiarize with green audit tools and software for efficient auditing processes. • Develop the ability to implement corrective actions for environmental improvements during on-site audits. • Enhance communication skills for effectively presenting green audit results to stakeholders.	
Course Outcomes	After successful completion of this course, students are expected to: • Demonstrate proficiency in conducting green audits and accurately reporting environmental data. • Utilize green audit tools and software to streamline auditing processes. • Implement corrective actions to drive sustainable environmental practices based on audit findings. • Communicate green audit results effectively to stakeholders through professional presentations.	
Sr. No.	Topic Particular	Hours
1	• Introduction to practical sessions and safety guidelines • Need and Goals of Green Audit	4
2	• Familiarization with green audit tools and software	4
3	• Conducting a preliminary environmental assessment of a selected organization	4
4	• Developing an audit plan, including objectives, scope, and criteria	6
5	• Data collection techniques and methods for evaluating environmental performance	6
6	• Analyzing and interpreting collected data for identifying non-compliance and areas for improvement	6

7	Documentation and reporting of audit findings	6
8	Practice in conducting on-site audits and interacting with auditees	6
9	Implementation of corrective actions and monitoring of improvements	6
10	Presentation of green audit results to stakeholders	6
11	Case studies and group exercises for real-world application of green audit principles	6
Study Resources	- International Organization for Standardization. (2015). ISO 19011:2018 Guidelines for auditing management systems. Geneva, Switzerland: ISO. - Environmental Protection Agency. (2020). Environmental Auditing: Basic Principles and Practices. Retrieved from https://www.epa.gov/compliance/environmental-auditing-basic-principles-and-practices - United States Department of Labor. (2021). Safety and Health Topics: Audit. Retrieved from https://www.osha.gov/a-z-index/audit - Institute of Environmental Management and Assessment (IEMA). (2018). EIA Practical Guide: A guide to environmental impact assessment in the UK and abroad (4th ed.). Rugby, UK: IEMA. - Burritt, R. L., & Schaltegger, S. (2014). Sustainable management accounting: Understanding the role of information in the pursuit of sustainable development. Routledge. - Green Soft Technology. (n.d.). Green Data Manager Software. Retrieved from https://www.greensofttech.com/ - Environmental Resources Management (ERM). (n.d.). Environmental Auditing Software. Retrieved from https://www.erm.com/en/services/sustainability-solutions/environmental-auditing/ - U.S. Environmental Protection Agency. (2021). ECHO: Enforcement and Compliance History Online. Retrieved from https://echo.epa.gov/ - Gomez, F., & Marimon, F. (2013). Practical Environmental Audit. Springer. - Environmental Audit Committee. (2020). Corporate governance and audit reform: Government response to the committee's Seventh Report of Session 2019.	

**F.Y.B.Sc.
Semester II
GEO-GOE-121: Air Pollution**

Total Hours: 30

Credits: 2

Learning objectives	- To introduce the concept of air pollution and its significance in environmental studies. - To provide awareness of sources type and cause of air pollution. - To recognize the health effects of air pollution on human populations and its consequences for public health. - To aware student with significant case studies of air pollution incidents and their consequences.
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Course outcomes	After successful completion of this course, students are expected to: • Understand the concept of air pollution and its significance in environmental studies. • Aware with sources type and cause of air pollution. • Aware with health effects of air pollution on human populations and its consequences for public health. • Do case studies of air pollution incidents and their consequences.	
Unit	Topic Particular	Hours
Unit I	Introduction to Air Pollution • Definition and scope of air pollution • Sources of air pollution: natural and anthropogenic • Major air pollutants: particulate matter, carbon monoxide, sulfur dioxide, nitrogen oxides, ozone, etc. • Health and environmental impacts of air pollution	8
Unit II	Types and Causes of Air Pollution • Different types of air pollution: outdoor and indoor • Industrial pollution and emissions from power plants • Vehicle emissions and transportation-related pollution • Agricultural practices and air pollution • Household pollution and its sources	6
Unit III	Impacts and Mitigation of Air Pollution • Health effects of air pollution on humans: respiratory diseases, cardiovascular issues, etc. • Environmental impacts: ecosystem degradation, acid rain, ozone depletion, etc. • Air pollution control measures: legislation and regulations • Technological solutions for reducing emissions • Renewable energy alternatives and their role in mitigating air pollution • Personal and community-level actions to reduce air pollution	8
Unit IV	Case Studies and Future Perspectives • Case studies of significant air pollution incidents and their consequences • Urban air pollution and its unique challenges • International efforts and agreements to combat air pollution • Emerging technologies and innovations for air pollution control • The importance of public awareness and education in addressing air pollution • Future trends and prospects in air pollution management	8
Study Resources	• Seinfeld, J. H., & Pandis, S. N. (2016). Atmospheric chemistry and physics: From air pollution to climate change (3rd ed.). Wiley. • Jacobson, M. Z. (2012). Atmospheric pollution: History, science, and regulation. Cambridge University Press. • Harrison, R. M., & Hester, R. E. (Eds.). (2013). Air pollution: Sources, impacts and controls. Royal Society of Chemistry. • Dockery, D. W., & Pope, C. A. (Eds.). (2018). Air pollution and health (2nd ed.). Elsevier. • Rao, S. T., & Rao, S. T. (2014). Air pollution. CRC Press. • Fitzgerald, J. W. (2014). Air pollution and forest decline: Lessons learned from	

	30 years of research. Springer. • Vallero, D. A. (2014). Fundamentals of air pollution (5th ed.). Academic Press. • Kampa, M., & Castanas, E. (Eds.). (2013). Human exposure to pollutants via dermal absorption and inhalation. Springer. • Goudie, A. S. (2014). The human impact on the natural environment: Past, present, and future (7th ed.). Wiley. • Stohl, A. (2013). Atmospheric transport and chemistry in the anthropocene. Springer.
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F.Y.B.Sc.
Semester II
GEO-SEC-121: Principles of GPS

Total Hours: 30

Credits: 2

Learning objectives	- To understand satellite system - To understand functional segments of GPS - To understand the navigation - To understand accuracy and Applicability of GPS	
Course outcomes	After successful completion of this course, students are expected to: - Aware with satellite system - Understand functional segments of GPS - Know the navigation of GPS - Enhance to knowledge applications of GPS	
Unit	Topic Particular	Hours
Unit I	Introduction to GPS: - Fundamental concepts of GPS - History of GPS development - Fundamental concept	8
Unit II	- Satellite system and GPS satellite - Functional segments of GPS - GPS satellite Segmentation	8
Unit III	- GPS positioning type - GPS receivers and codes, antenna - Factors affecting of GPS - Navigation signals	8
Unit IV	- Accuracy and error sources - Satellite based navigational systems: - GLONASS, GALILEO, IRNSS - Applications of GPS	6
Study Resources	- Ahmed, E. L. Rabbany (2002). Introduction to Global Positioning Systems. Boston: Artech House - Alfred leick: John Wiley 2012 GPS satellite surveying - Burrough, P. A. & McDonnell, R.A. (2000). Principles of Geographical	

	Information Systems. New York: Oxford University Press. • Christopher J. Hegarty, Elliott D. Kaplan (2017) Artech House Publishers Understanding GPS: Principles and Applications • Chang, K. T. (2008). Introduction to Geographic Information Systems. Avenue of the Americas, New York: McGraw-Hill. • Chichester: John Wiley & Sons. Lo, C. P., Yeung, A. W. (2002). Concepts Techniques of Geographical Information Systems. New Delhi: Prentice-Hall of India. • Gunter Seebar: De Gruyter 2003 Satellite Geodesy • Heywood, I., Cornelius, S., Carver, S. (2011). An Introduction to Geographical Information Systems, New Delhi: Pearson Education. • Korte, G. B. (2001). The GIS Book, Bangalore: Onward Press. 5. Demers, M. N. (2000). Fundamentals of Geographic Information Systems. New Delhi: John Wiley and Sons. • Lawrence Letham (Author), Alex Letham GPS Made Easy: Using Global positioning Systems in the Outdoors Lawrence Letham • Longley, P. A., Goodchild, M. F., Maguire, D. J., Rhind, D. W. (2002). Geographical Information Systems and Science. • Rich Owings:2005 Ten Mile Press: GPS Mapping • Stephen W. Hinch :2018 Wilderness Press Outdoor Navigation with GPS Stephen
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F.Y.B.Sc.
Semester II
GEO-SEC-122: Applications of GPS

Total Hours: 30

Credits: 2

Learning objectives	• To understand satellite system • To understand functional segments of GPS • To understand the navigation • To understand accuracy and Applicability of GPS	
Course outcomes	After successful completion of this course, students are expected to: • Aware with satellite system • Handle GPS device • Captured waypoints • Apply of GPS in different applications	
Unit	Topic Particular	Hours
Unit I	Introduction to GPS and Basic Concepts • Historical background and development of GPS • Overview of GPS components and operation • GPS signal structure and characteristics • Satellite constellation and orbital parameters • Triangulation and trilateration methods • Differential GPS (DGPS) concepts and benefits	8

Unit II	GPS Applications in Navigation and Mapping • Vehicle, pedestrian, aviation, and marine navigation systems • Geodetic surveys and mapping • Topographic mapping using GPS • Digital elevation models and terrain mapping • GIS data collection and integration with GPS	6
Unit III	GPS Applications in Geodesy and Surveying • Establishment and maintenance of control networks • High-precision GPS data processing • Static, kinematic, and RTK positioning • Cadastral surveys and land administration • GPS in engineering surveys and construction layout	8
Unit IV	Advanced GPS Applications • GPS timing and synchronization • GPS in precision agriculture • Location-based services (LBS) and GPS tracking • Emerging trends in augmented reality and GPS integration • Autonomous vehicles and GPS navigation • Internet of Things (IoT) and GPS connectivity	8
Study Resources	• Ahmed, E. L. Rabbany (2002). Introduction to Global Positioning Systems. Boston: Artech House • Alfred leick: John Wiley 2012 GPS satellite surveying • Burrough, P. A. & McDonnell, R.A. (2000). Principles of Geographical Information Systems. New York: Oxford University Press. • Christopher J. Hegarty, Elliott D. Kaplan (2017) Artech House Publishers Understanding GPS: Principles and Applications • Chang, K. T. (2008). Introduction to Geographic Information Systems. Avenue of the Americas, New York: McGraw-Hill. • Chichester: John Wiley & Sons.. Lo, C. P., Yeung, A. W. (2002). Concepts Techniques of Geographical Information Systems. New Delhi: Prentice-Hall of India. • Gunter Seebar: De Gruyter 2003 Satellite Geodesy • Heywood, I., Cornelius, S., Carver, S. (2011). An Introduction to Geographical Information Systems, New Delhi: Pearson Education. • Korte, G. B. (2001). The GIS Book, Bangalore: Onward Press. 5. Demers, M. N. (2000). Fundamentals of Geographic Information Systems. New Delhi: John Wiley and Sons. • Lawrence Letham (Author), Alex Letham GPS Made Easy: Using Global positioning Systems in the Outdoors Lawrence Letham • Longley, P. A., Goodchild, M. F., Maguire, D. J., Rhind, D. W. (2002). Geographical Information Systems and Science. • Rich Owings:2005 Ten Mile Press: GPS Mapping • Stephen W. Hinch :2018 Wilderness Press Outdoor Navigation with GPS • Stephen	