Background

Considering the curricular reforms as instrumental for desired learning outcomes, all the academic departments of Maharaja Ganga Singh University, Bikaner made a rigorous attempt to revise the curriculum of undergraduate and postgraduate programmes in alignment with National Education Policy-2020 and UGC Quality Mandate for Higher Education Institutions-2021. The process of revising the curriculum could be prompted with the adoption of "Comprehensive Roadmap for Implementation of NEP-2020". The Roadmap identified the key features of the Policy and elucidated the Action Plan with well-defined responsibilities and indicative timeline for major academic reforms.

The process of revamping the curriculum started with the series of webinars and discussions conducted by the University to orient the teachers about the key features of the Policy, enabling them to revise the curriculum in sync with the Policy. Proper orientation of the faculty about the vision and provisions of NEP-2020 made it easier for them to appreciate and incorporate the vital aspects of the Policy in the revised curriculum focused on 'creating holistic, thoughtful, creative and well-rounded individuals equipped with the key 21st century skills' for the 'development of an enlightened, socially conscious, knowledgeable, and skilled nation'.

With NEP-2020 in background, the revised curricula articulate the spirit of the policy by emphasising upon— integrated approach to learning; innovative pedagogies and assessment strategies; multidisciplinary and cross-disciplinary education; creative and critical thinking; ethical and Constitutional values through value-based courses; 21st century capabilities across the range of disciplines through life skills, entrepreneurial and professional skills; community and constructive public engagement; social, moral and environmental awareness; Organic Living and Global Citizenship Education (GCED); holistic, inquiry-based, discovery-based, discussion-based, and analysis-based learning; exposure to Indian knowledge system, cultural traditions and classical literature through relevant courses offering 'Knowledge of India'; fine blend of modern pedagogies with indigenous and traditional ways of learning; flexibility in course choices; student-centric participatory learning; imaginative and flexible curricular structures to enable creative combination of disciplines for study; offering multiple entry and

exit points initially in undergraduate programmes; alignment of Vocational courses with the International Standard Classification of Occupations maintained by the International Labour Organization; breaking the silos of disciplines; integration of extra-curricular and curricular aspects; exploring internships with local industry, businesses, artists and crafts persons; closer collaborations between industry and higher education institutions for technical , vocational and science programmes; and formative assessment tools to be aligned with the learning outcomes, capabilities, and dispositions as specified for each course. In case of UG programmes in Engineering and Vocational Studies, it was decided that the departments shall incorporate pertinent NEP recommendations while complying with AICTE, NBA, NSQF, International Standard Classification of Occupations, Sector Skill Council and other relevant agencies/sources. The University has also developed consensus on adoption of Blended Learning with 10% component of online teaching and 90% face to face classes for each programme.

The revised curricula of various programmes could be devised with concerted efforts of the faculty, Heads of the Departments and Deans of Faculty. The draft prepared by each department was discussed in series of discussion sessions conducted at Department, Faculty and the University level. The leadership of the University has been a driving force behind the entire exercise of developing the uniform template and structure for the revised curriculum. The Vice Chancellor of the University conducted series of meetings with Heads and Deans to deliberate upon the vital parameters of the revised curriculum to formulate a uniform template featuring Background, Programme Outcomes, Programme Specific Outcomes, Postgraduate Attributes, Structure of Masters Course, Learning Outcome Index, Semester-wise Courses and Credit Distribution, Course-level Learning Outcomes, Teaching-Learning Process, Blended Learning, Assessment and Evaluation, Keywords and References. The experts of various Boards of Studies contributed to a large extent in giving the final shape to the revised curriculum of each programme. Stimulated Sessions were conducted under the dynamic leadership or the IQAC, Maharaja Ganga Singh University to give a final shape to the curricula. It is due to their endeavors that the curricula could acquire its present shape.

To ensure the implementation of curricular reforms envisioned in NEP-2020, the University has decided to implement various provisions in a phased manner. Therefore, the curriculum may be reviewed annually so as to gradually include all relevant provisions of NEP-2020.

Program Outcome (PO)

Vision

To be recognized as a frontrunner in Remote Sensing and GIS technologies through quality education and research by exploring space technologies and its applications for healthier future and socio-economic development of the country.

Mission

To explore new avenue in the field of Remote Sensing and Geographic Information System (GIS) technologies and developing new techniques in operational utilization of RS & GIS technologies in various fields. Conducting disciplinary and integrative research in the physical and social sciences that spans local to global scales, with an emphasis on a geospatial perspective of our changing planet and its sustainability.

On completing PG Diploma in Geoinformatics and GIS, the students shall be able to realize the following outcomes:

- **PO1. Application of Remote Sensing and GIS**
  This programme would be helpful for the interested learners to develop skills in this field for further studies and also to pursue a career in government organizations, industries and educational institutes in the field of natural resources management, natural hazards and disaster management, environment management, urban and rural planning, business applications and geospatial education.
- **PO2. Modern Tool Usage:**
  Ability to create, select, and apply appropriate techniques, resources and modern remote sensing and GIS tools including prediction, modeling and analysis to environmental problems with an understanding of the limitations.

- **PO3:. Environmental and Sustainability:**

  Understand the impact of the professional Geoinformatics and Remote Sensing techniques for solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.

  PO4. Ethics:

  Apply ethical principles and commit to professional ethics and responsibilities and norms of the Remote Sensing and GIS tools.

  PO5. Individual and Team Work:

  Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.

  PO6. Communication:

  Communicate effectively on complex environmental system with the scientific community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.

  PO7. Project Management and Finance:

  Demonstrate knowledge and understanding of the environmental management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

  PO8. Life-long Learning:

  Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Duration:1 Year

Desirable: Knowledge of computer applications

No. of Seats: 30

Scheme of examination and courses of study

1. **Eligibility:** Candidates for admission to the PGDGRS shall be required to have Bachelor's Degree in Environmental Science/ Life Science/ Geography / Geology / Statistics / Physics / Mathematics / Computer Science / Computer Applications / Forestry / Wildlife / Agricultural Science and B. Tech. / B.E. from a UGC recognized University or Institutions with 48 % aggregate marks.

2. Admission will be given on the basis of Merit. The Merit will be drawn on aggregate marks received in the qualifying examination by the candidate.

3. The duration of the course is of one academic year. The course work of the PGDGRS shall be in accordance with the scheme of examinations and syllabus prescribed.

4. The minimum attendance required by a candidate will be as per university rules.

5. A candidate for a pass the Diploma examination shall be required to obtain:

   a. At least 36% mark in the aggregate of the papers prescribed for the examination and

   b. At least 36% marks in the practical(s)

6. Wherever prescribed at the examination, provided that a candidate fails to secure at least 25% marks in each individual theory paper at the examination he/she shall be deemed to have failed at the examination notwithstanding having obtained the minimum percentage of marks required in the aggregate for the examination.

7. Division shall be awarded at the end of the examination and marks obtained after one-year examinations taken together as noted below:

First Division	60% of aggregate of above marks taken together.
Second Division	48% of aggregate of above marks taken together.

   All the rest will be declared to have passed the examination

8. There will be 4 courses of 100 marks and one Practical course will be of 200 marks.

9. An educational tour may be organized for PGDGRS students to important places of environmental interest within or outside the State under the supervision of faculty members of the department. The expenses will be borne by the participating student. However, the university will provide train/bus travel concessions as per necessity and university rules. Traveling expenses of the teacher/s will be borne by the university as per rules of TA and DA.

Structure of Programme

Paper Code	Paper Name	Maximum Marks	Minimum Passing Marks
PDG-101	Fundamental Concept of Earth System	100	36
PDG-102	Fundamentals and Applications of Remote Sensing	100	36
PDG-103	Fundamentals of Geographical Information System	100	36
PDG-104	Project report/ Case study*	100	36
Practical	Practical	200	72

* The project report / Case study should be focused on application of GIS and Remote sensing.

Course Title: Fundamental Concept of Earth System

Course Code: PGD 101

Unit-1: The Earth: its shape and size; Datum and co-ordinate systems; Geographical and projected co-ordinate system and grid system; Choice and classification of map projections; fundamentals of photogrammetry. Photointerpretation- elements and application; Lineament study and analysis. Thematic map preparation.

Unit-2: Introduction to GPS; Types of GPS; GPS satellite; data receiver and control points; Differential GPS; Sources of GPS errors; Application of GPS in surveying, mapping and navigation. Geo-Statistics, GIS & Computer programming Nature of geographical samples

Unit-3: History and Development of cartography:Sources of cartographic data; Scale: types & importance; Cartographic methods and techniques for preparation of maps and diagrams; General maps: types and applications; Thematic maps: types and applications; Introduction to Digital Cartography. Cartography & Image processing Map scales, enlargement reduction, types and conversions, symbolization, Representation of statistical data on maps,

References:

1. Bailey, T. and Gatrell, A. C. (1995): Interactive Spatial Data Analysis. Longman, Harlow. 2. Dorling, D. and Fairborn, D. (1997): Mapping. Ways of Representing the World. Longman, Harlow. 3. Fraser Taylor, D.R. (1980): The Computer in Contemporary Cartography. John Wiley and Sons, New York. 4. Fraser Taylor, D.R. (ed.) (1983): Graphic Communication and Design in Contemporary Cartography. John Wiley and Sons, New York. 5. Griffith, D. A. and Amehein (1997): Multivariate Statistical Analysis for Geographers. Prentice Hall, Englewood Cliffs, New Jersey. 6. Griffith, D. A. and Amehein (1997): Statistical Analysis for Geographers. Prentice Hall, Englewood Cliffs, New Jersey. 7. Kanetkar, T.P. and Kulkarni, S.V. (1967): Surveying and Levelling, Part II, A.V.G. Prakashan, Poona.

Course Title: Fundamentals and Applications of Remote Sensing

Course Code: PGD 102

Unit-1: Introduction & Principles of Remote Sensing Basics: Definition and scope of remote sensing; History and development of remote sensing technology; Electromagnetic radiation (EMR) and electromagnetic spectrum; EMR interaction with atmosphere and earth surface; Atmospheric window and spectral reflectance curve; Resolutions in remote sensing; Types of remote sensing; Principles of optical, thermal & microwave remote sensing.

Unit-2: Aerial photography Aerial photographs: types, scale, & resolution; Types of aerial cameras and photographic films; Geometry of aerial photographs; Flight planning; Impact of season, time, & topography on aerial photographs; Parallax, relief displacement, and orthophotos. Satellite Remote Sensing.

Unit-3: Image Interpretation & Applications of Remote Sensing Elements of visual image interpretation; Aerial photos vs. satellite imagery; Application of remote sensing in (a) Land use/ land cover mapping, (b) Landform analysis, (c) Resource evaluation, (d) Natural hazards assessment, and (e) Urban & regional planning, (f) Environmental Impact Assessment

References:

1. Aber, J.S., Marzolff, I., and Ries, J. (2010): Small-Format Aerial Photography: Principles, Techniques and Geoscience Applications, Elsevier, Amsterdam, 268pp. 2. Campbell, J.B., and Wynne, R.H. (2011): Introduction to Remote Sensing (5th Ed.), Guilford Press, New York, 667pp. 3. Jensen, J.R. (2006): Remote Sensing of the Environment: An Earth Resource Perspective (2nd Ed.), Prentice Hall, New Jersey, 608pp. 4. Konecny, G. (2003): Geoinformation: Remote sensing, Photogrammetry and Geographic Information Systems, Taylor & Francis, London, 266pp. 5. Lillesand, T.M., Kiefer, R.W., and Chipman, J.W. (2007): Remote Sensing and Image Interpretation (6th Ed.). Wiley, New Jersey, 804pp. 6. Morgan, D., and Falkner, E. (2001): Aerial Mapping: Methods and Applications (2nd Ed.), CRC Press, Boca Raton, Florida, 216pp. 7. Quattrochi, D.A., and Goodchild, M.F. (1997): Scale in Remote Sensing and GIS, CRC Press, Boca Raton, Florida, 432pp. 8. Reddy, M.A. (2008): Textbook of Remote Sensing and Geographical Information System (3rd Ed.), BS Publications, Hyderabad, 476pp.

Course Title: Fundamentals of Geographical Information System

Course Code: PGD 103

Unit 1: Introduction to GIS: Definition of GIS, History and development of GIS, Components of GIS, Hardwares and Softwares, GIS operations, Future of GIS. Basic GIS: Representation of Geographic features in Raster and Vector data model: Advantages and Disadvantages; Point, line and polygon; Concept of Arc, node and vertices; Spatial data input: Digitization and Conversion, Digitization errors; Topology: Error and editing.

Unit 2: GIS data quality: errors, policies.GIS Analysis: Vector data analysis: Buffering, Overlay analysis (point in polygon, line in polygon, polygon in polygon etc.); Network analysis; Terrain analysis: DEM, DTM and TIN; Interpolation techniques in GIS; Raster data analysis.

Unit 3: GIS Applications: Applications of GIS in Urban and Regional planning, Water resource management, Soil resource Management, Forestry and Environment, Public utilities. Non-spatial data: Database Management system (DBMS): Components, Schema, Database design, Relationship and Normalization.

Reefrences:

1. Adriaans, P., and D. Zantinge. 1996. Data Mining. New York: Addison-Wesley. 2. Bernhardensen, Tor. 1999. Geographic Information Systems: An Introduction. Toronto: John Wiley & Sons, Inc. 3. Bishop, Michael P. and Shroder, John F. (Eds.) 2004. Geographic Information Science and Mountain Geomorphology. Chichester, U.K.: Praxis Publishing (Springer).11 4. Bracken, Ian and Webster, Christopher. 1990. Information Technology in Geography and Planning (Including Principles of GIS). London & New York: Routledge. 5. Burrough, Peter A. and McDonnell, Rachael A. 1998. Principles of Geographical Information Systems – Spatial Information Systems and Geostatistics. Oxford University Press. 6. Buttenfield, B.P. and R.P. McMaster 1991. Map Generalization: Making Rules for Knowledge Presentation. New York: Wiley. 7. Chang, Kang-tsung. 2002. Introduction to Geographic Information Systems. New Delhi: Tata McGraw-Hill Publishing Company Limited. 8. Chrisman, N. 1998. “Academic Origins of GIS,” In T. Foresman (Ed): The History of Geographic Information Systems. Upper Saddle River, NJ: Prent ice Hall, pp. 33-43.

Course Title: Project report / Case study

Course Code: PGD 104

The dissertation work will be aimed at describing the change detection of land use/ land cover using remotely sensed data and geographic information systems (GIS) tools.The project report / Case study should be focused on application of GIS and Remote sensing.

References

1. **www.qgis.org/en/site/**
2. Core Spatial Data Analysis: Introductory GIS with R and QGIS | Udemy
3. QGIS Tutorials and Tips — QGIS Tutorials and Tips
4. www.qgistutorials.com/en/

Practical

1. Getting started with Q-GIS
2. Projection and reprojection
3. Geo-referencing of a toposheet.
4. Image Registration.
5. Digitization of toposheet
6. Map preparation
7. Data Exploration
8. Working with tables
9. Spatial Querying
10. Attribute Querying
11. Working with Google earth
12. Multi criteria analysis
13. GPS Handling

References

5. **www.qgis.org/en/site/**
6. Core Spatial Data Analysis: Introductory GIS with R and QGIS | Udemy
7. QGIS Tutorials and Tips — QGIS Tutorials and Tips
8. www.qgistutorials.com/en/