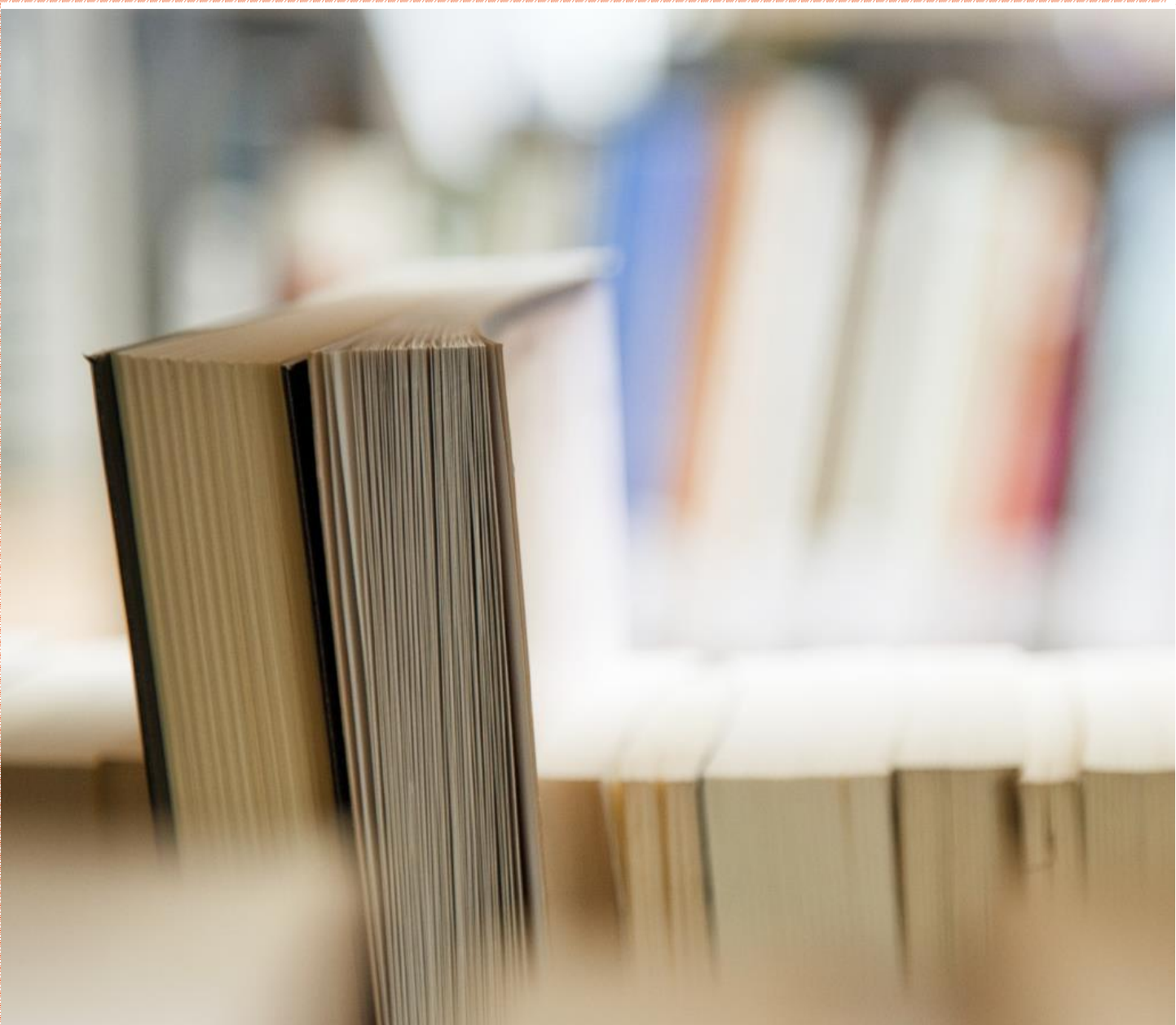




SGRR UNIVERSITY

**Brochure of Value-Added Courses
School of Basic and Applied Sciences
2025-2026**

ABOUT THE UNIVERSITY

Shri Guru Ram Rai University was established by a religious and philanthropic leader, Shri Mahant Devendra Dass Ji Maharaj in the year 1977. It is situated in the heart of city, Uttarakhand. We are extremely privileged to extend the values and ethos of the Shri Guru Ram Rai Education mission through SGRR University to impart quality education and in successfully placing more than 80% students in various companies across the globe. SGRR University has humongous campus spread over 80 acres of land. Its state-of-art facilities give opportunities to develop leadership skills and to achieve professional excellence. It has 8000+ students from different countries, 29 states and Union Territories and providing cultural melange and global exposure to our students. One of the biggest boosts from University is its unmatched experience of 67 years of in delivering quality education that helps to develop confidence and will give you more knowledge, industry exposure, building good networking and high self-esteem. This will change your overall personality and develop you into a complete professional to face any challenge.

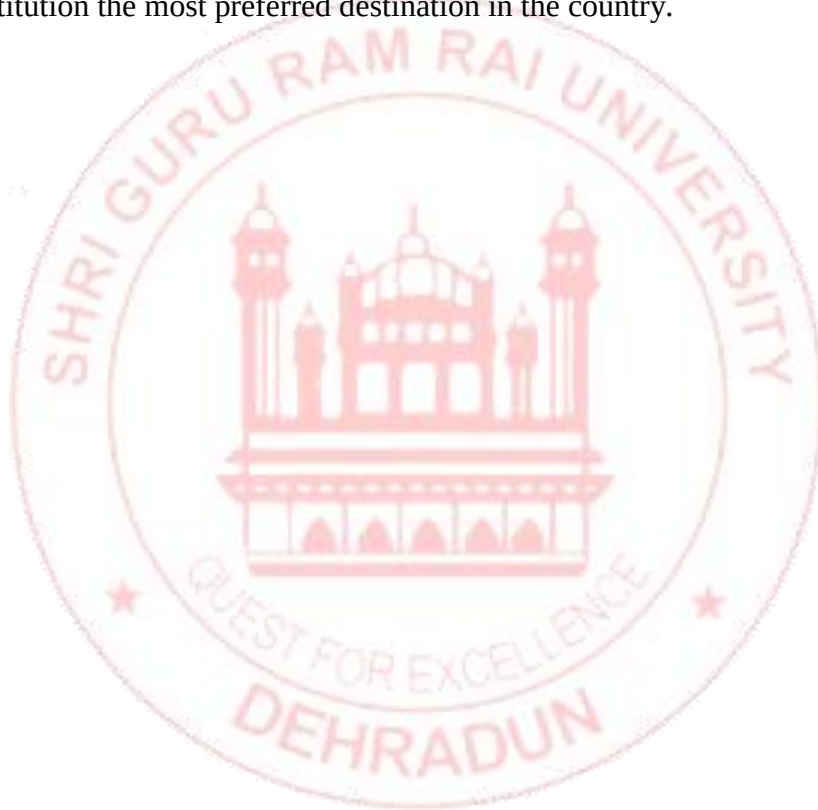
Vision

“To establish Sri Guru Ram Rai University to be a Center of Excellence in higher education, innovation and social transformation by nurturing inquisitive and creative minds and by enabling the stakeholders to become committed professionals and educators of national and global relevance.”

Mission

- ❖ To provide a comprehensive and sustainable educational experience that fosters the spirit of enquiry, scientific thinking and professional competence along with ethical and spiritual values
- ❖ To deliver a classic, well rounded learning experience that is distinctive and impactful on the young generation preparing them for a successful career
- ❖ To engage, inspire and challenge the stakeholders to become leaders with ethics and positive contributors to their chosen field and humane citizens
- ❖ To attract, train and retrain qualified staff to work efficiently to bring forth the maximum resource potential
- ❖ To develop committed and responsible professionals who work for the welfare of the society by providing innovative and efficient solutions and creating long term relationship with the stakeholders

- ❖ To create a sustainable career, by collaborating with stakeholders and participating in community partnership for life and livelihood in the local society in a responsive and dynamic way
- ❖ To make our students globally competent by introducing specialized training leading to professional capabilities and developing diverse skills in them for competitive advantage.
- ❖ To establish quality standards for generations by epitomising professionalism and integrity while raising the achievements of students.
- ❖ To ceaselessly pursue excellence by strengthening a learning environment that makes the institution the most preferred destination in the country.



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The ever-changing global scenario makes the world more modest and needs high levels of lateral thinking and the spirit of entrepreneurship to cope up with the emergent challenges. Many a times, the defined skill sets that are being imparted to students today with Programme Specific Objectives in educational institutions become redundant sooner or later due to rapid technological advancements. No university curriculum can adequately cover all areas of importance or relevance. It is important for higher education institutions to supplement the curriculum to make students better prepared to meet industry demands as well as develop their own interests and aptitudes.

Objectives The main objectives of the Value-Added Course are:

- ✓ To provide students an understanding of the expectations of industry.
- ✓ To improve employability skills of students.
- ✓ To bridge the skill gaps and make students industry ready.
- ✓ To provide an opportunity to students to develop inter-disciplinary skills.
- ✓ To mould students as job providers rather than job seekers.

Course Designing The department interested in designing a Value Added Course should undertake Training Need Analysis, discuss with the generic employers, alumni and industrial experts to identify the gaps and emerging trends before designing the syllabus.

Conduction of value added courses :

Value Added Course is not mandatory to qualify for any programme and the credits earned through the Value-Added Courses shall be over and above the total credit requirement prescribed in the curriculum for the award of the degree. It is a teacher assisted learning course open to all students without any additional fee.

Classes for a VAC are conducted during the RESERVED Time Slot in a week or beyond the regular class hours. The value-added courses may be also conducted during weekends / vacation period. A student will be permitted to register only one Value Added Course in a Semester.

student will be encouraged to opt for the VAC offered by his/her parent Department/Faculty. Industry Experts / Eminent Academicians from other Institutes are eligible to offer the value-added course. The course can be offered only if there are at least 5 students opting for it. The students may be allowed to take value added courses offered by other departments after obtaining permission from Dean offering the course. The duration of value added course is 30 hours with a combination 18 hours (60%) of theory and 12 hours (40%) of practical. However, the combination of theory and practical shall be decided by the course teacher with the approval of the Dean

GUIDELINES FOR CONDUCTING VALUE ADDED COURSES

- ❖ Value Added Course is not mandatory to qualify for any program.
- ❖ It is a instructor supported learning course open to all students without any added fee.

- ❖ Classes for VAC will be conducted during the **RESERVED** Time Slot in a week or beyond the regular class hours.
- ❖ The value-added courses may be also conducted during weekends / vacation period.
- ❖ A student will be permitted to register only one Value Added Course in a Semester.
- ❖ Students may be permitted to enrol in value-added courses offered by other departments/ Schools after obtaining permission from the Department's Head offering the course.

DURATION AND VENUE

- ❖ The duration of value-added course should not be less than 30 hours.
- ❖ The Dean of the respective School shall provide class room/s based on the number of students/batches.
- ❖ VAC shall be conducted in the respective School itself.

REGISTRATION PROCEDURE

The list of Value-Added Courses, along with the syllabus, will be available on the University Website. A student must register for a Value-Added Course offered during the semester by completing and submitting the registration form. The Department Head shall segregate according to the option chosen and send it to the Dean of the school offering the specific Value-Added Courses.

- ❖ Each faculty member in charge of a course is responsible for maintaining Attendance and Assessment Records for candidates who have registered for the course.
- ❖ The Record must include information about the students' attendance and Assignments, seminars, and other activities that were carried out.
- ❖ The record shall be signed by the Course Instructor and the Head of the Department at the end of the semester and kept in safe custody for future verification.
- ❖ Each student must have a minimum of 75% attendance in all courses for the semester in order to be eligible to take certificate.
- ❖ Attendance requirements may be relaxed by up to 10% for valid reasons such as illness, representing the University in extracurricular activities, and participation in NCC.
- ❖ The students who have successfully completed the Value Added Course shall be issued with a Certificate duly signed by the Authorized signatories.

Basics of Machine Learning

Course Code: VCSBAS024

Course Objective (CO):

- Students will grasp the fundamental principles of machine learning, particularly supervised learning.
- Students will learn to evaluate the performance of classification models using standard metrics.

Course Outcomes (CO): At the end of the course, the student will be able to

- Remember the core concepts of target variables, features, and labels.
- Understand the basic applications of classification and regression in supervised learning.
- Apply key classification algorithms such as Naïve Bayes, K-NN, Decision Trees, and Logistic Regression.
- Analyze model performance using evaluation metrics like Confusion Matrix, Precision, Recall, F1-Score, and ROC-AUC.
- Prepare data for machine learning models and understand concepts of model generalization.
- Evaluate and select appropriate supervised machine learning models for basic real-world classification problems based on their performance metrics.

Course Contents:

Unit 1: Introduction to Machine Learning, Target Variables, Features, Labels, Supervised Learning (Classification, Regression), Train-Test Split.

Unit 2: Data Preprocessing, Handling Missing Values, Feature Scaling, Overfitting, Underfitting, Bias-Variance Trade-off, Cross-Validation.

Unit 3: Classification Introduction, Naïve Bayes, K-Nearest Neighbors (K-NN), Decision Trees.

Unit 4: Logistic Regression, Support Vector Machines (SVM) with Kernels, Confusion Matrix, Precision, Recall, F1-Score, ROC-AUC.

Recommended Books:

1. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.
2. Hal Daumé III, A Course in Machine Learning, 2023.
3. Tom Mitchell, Machine Learning, McGraw Hill, 1997.
4. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, An Introduction to Statistical Learning: with Applications in R, Springer, 2013. (Recommended for practical applications)

Acaademic Writing

Course Code: VCSBAS025

Course Objectives

To introduce students to the fundamentals of academic and research writing

To develop skills for writing research papers, reviews, and theses

To enhance clarity, coherence, and ethical standards in scholarly communication

To familiarize students with citation styles, plagiarism policies, and journal publication processes

Module 1: Introduction to Research Writing; Meaning and importance of research writing; Types of academic writing (thesis, dissertation, journal article, review paper); Characteristics of good research writing; Research ethics and integrity; Common challenges in research writing

Module 2: Structure of Research Documents; Research paper structure: IMRaD format; Title, abstract, and keywords; Introduction and problem statement; Materials and methods / methodology; Results; discussion, and conclusion

Module 3: Literature Review and Academic Style; Purpose and types of literature review; Searching scientific literature (Google Scholar, Scopus, Web of Science); Paraphrasing, summarizing, and synthesizing literature; Academic tone, grammar, and coherence; Avoiding common writing errors

Module 4: Referencing, Citation, and Plagiarism; Importance of citations; Citation styles: APA, MLA, Chicago, Harvard, Vancouver; Reference management tools (Mendeley, Zotero, EndNote – overview); Plagiarism: types, detection tools, and prevention; Copyright and ethical publishing practices

Module 5: Publication and Scientific Communication; Selecting suitable journals; Journal impact factor, indexing, and predatory journals; Peer review process; Responding to reviewers' comments; Writing cover letters and research summaries; Teaching–Learning Methods; Lectures and interactive discussions; Hands-on writing exercises; Case studies of published research papers; Group discussions and peer review; Assessment Methods; Assignment on literature review; Research abstract writing; Plagiarism check report; Final research paper / proposal submission

Reference Books

Day, R. A., & Gastel, B. (2012). How to Write and Publish a Scientific Paper. Cambridge University Press.

Cargill, M., & O'Connor, P. (2013). Writing Scientific Research Articles: Strategy and Steps. Wiley-Blackwell.

Swales, J. M., & Feak, C. B. (2012). Academic Writing for Graduate Students. University of Michigan Press.

Wallwork, A. (2016). English for Writing Research Papers. Springer.

APA Publication Manual (7th Edition). American Psychological Association.

Course Outcomes (COs)

CO1: Understand the structure and components of academic and research writing

CO2: Apply effective academic writing styles with clarity, coherence, and precision

CO3: Write research proposals, abstracts, and literature reviews

CO4: Use appropriate referencing and citation styles and avoid plagiarism

CO5: Prepare manuscripts suitable for publication in peer-reviewed journals



Laboratory Techniques in Chemical Analysis

Course Code: VCSBAS026

Course Objectives:

Hours: 30

1. To understand the basic introduction of laboratories safety rules, studied about different reagents used in the laboratories and safety measures that have been taken while working in the laboratory.
2. To understand the preparation of standard solution in laboratory.
3. To understand the concept of gravimetric analysis and different basic processes like precipitation, digestion, filtration, drying, ignition and cooling.

Course Outcomes: At the completion of the course learner will able to-

- Describe laboratory safety procedures, emergency protocols, safe handling of chemicals, and proper use and calibration of glassware.
- Calculate concentrations of solutions using molarity, normality, molality, percentage, and parts per million, and perform solution preparation and dilution.
- Differentiate between various qualitative and quantitative analytical techniques, including volumetric, acid-base, redox, complexometric, and gravimetric analysis.
- Operate and calibrate pH meters, conductometers, and colorimeters while determining accuracy, precision, least count, and experimental errors.
- Perform standard solution preparation, dilution, qualitative and quantitative analysis, and calibration of laboratory instruments.
- Evaluate experimental results to determine the reliability of measurements and identify significant sources of experimental error.

Module-I

(4 lectures/hrs.)

Safety aspects in Chemical Laboratory; Emergency procedures; Safe handling and calibration of glassware; Safety in storage and handling of materials and precautions.

Module-2

(6 lectures/hrs.)

Mole concept and concentration- Normality, Molarity, Molality, Percentage (v/v,w/w,w/v), parts per million etc; preparation of solutions of solid and liquid compounds, standardization procedures and dilution; pH of solutions, preparation of buffer solutions.

Module-3

(6 lectures/hrs.)

Principles of qualitative and quantitative analysis- inorganic and organic mixtures, types of volumetric analysis, types of indicators, acid base titrations, iodometric and iodimetric

titrations, complexometric titrations, gravimetric techniques and analysis procedure

Module-4 (6 lectures/hrs.)

Basic principle commonly used instruments- pH meter, conductometer, colorimeter. calibration, accuracy and precision, least count, measure of accuracy, precisions and errors

Module-5 (Practical) (8 hrs.)

Practical based on following heads; Setting and assembling of apparatus; Preparation of standard solutions and dilution; Qualitative and quantitative analysis; Calibration of instruments



Ground Water Explorations

Course Code: VCSBAS027

Course Objectives:

1. Students will understand the problem related to the groundwater.
2. To ensure that students begin to understand the relationship between surface and subsurface groundwater management.

Course Outcomes:

1. To gain knowledge overview of methods for groundwater explorations
2. Understanding the concept of ground water recharge
3. Understand the concept of different methods of groundwater exploration.

Module I: Role of groundwater, historical background, and utilization. Objectives of groundwater exploration, geology of groundwater occurrence, Origin, age and vertical distribution of ground water (Vadose zone and Phreatic zone), rock properties affecting groundwater

Module II: Overview of methods of groundwater exploration, Concept & methods of artificial ground water recharge. Types of Aquifer; Aquifer Properties – Permeability, Storage, Storativity, Transmissivity and Darcy's Law.

Module III: Geological, geophysical, electrical resistivity, seismic refraction methods for surface investigation of ground water. Collection techniques of water sampling.

Reference Books:

D.K. Todd and L. F. Mays, "Groundwater Hydrology", John Wiley and sons.
K. R.Karant, "Hydrogeology", Tata McGraw Hill Publishing Company.
S. Ramakrishnan, "Ground water", S. Ramakrishnan.

Energy Storage Techniques and Applications

Course Code: VCSBAS028

Course Objectives: To equip learners with a deep understanding of electrochemical principles governing battery and supercapacitor systems, from materials design to performance optimization.

Course Outcomes

- Explain the basic principles of electrochemistry, including cell types, thermodynamics, and kinetics
- Analyze mass transport, Nernst equation applications, and electrode potential behavior in electrochemical systems
- Classify and describe different types of supercapacitors and their charge storage mechanisms
- Compare and evaluate battery technologies, focusing on design, characteristics, and emerging applications
- Assess sustainability practices in energy storage, including recycling, second-life applications, and waste-derived materials
- Explore future trends and industrial innovations, such as 2D materials, MSME-scale prototyping, and ESG-aligned systems

Course Contents

Unit I

Fundamentals of Electrochemistry: Electrochemical cell type: Galvanic and electrolytic cells: thermodynamics and kinetics, Charge transfer processes and mass transport, Nernst equation, electrode potentials, and reaction mechanisms.

Unit -II

Supercapacitor Principal and Application: Supercapacitor, Types and Classification, electrochemical double-layer capacitors (EDLCs), pseudo capacitors, hybrid systems, Charge storage mechanisms: surface adsorption vs. redox activity, Emerging applications

Unit -III

Batteries: Principal and Application: Primary and secondary: Basic concept, Battery design, General Characteristics, Applications, Types, and Characteristics, Comparison of the Performance Characteristics of Battery Systems, Advanced Batteries for Electric Vehicles, and Emerging Applications.

Unit IV

Integration, Innovation, and Future Trends: Comparative analysis of batteries and supercapacitors, Sustainability: recycling, second-life applications, and waste-derived materials, Emerging trends: 2D materials, stretchable electrodes, and MSME-scale innovations, Industrial prototyping and real-world deployment, ESG alignment, techno-economic assessment, and circular economy principles

Textbooks [TB]

TB1: *Electrochemical Power Sources* – V.S. Bagotsky

TB2: *Modern Electrochemistry I & II* – Bockris & Reddy

Reference Books [RB]

RB1: *Electrochemical Supercapacitors* – B.E. Conway

RB2: *Lithium-ion Batteries: Science and Technologies* – Yoshio et al.

RB3: *Nanostructured Materials for Electrochemical Energy Storage* – Springer Series

