# Course Descriptions

## ART 200 - Principles of Design & Media

Semester Units:   3
Prerequisite:       WR-I

This course delves into the fundamental principles of design and their application within media contexts. Underlying the fusion of form and function where aesthetics converge with ethics and creativity intertwines with critical inquiry, this course ensures that students develop a nuanced understanding of the intricate interplay between design principles and contemporary media landscapes. Through practical exercises and real-world applications, students will develop the core competencies necessary upon which to build a solid foundation in design and media principles and applications.

Course Learning Outcomes
● Demonstrate comprehension of the foundational principles of design and their practical applications in diverse media forms.
● Cultivate visual literacy skills, enabling critical analysis and interpretation of visual communication in various media contexts.
● Apply principles of color theory effectively to enhance the aesthetic appeal and communicative efficacy of design projects.
● Evaluate ethical considerations inherent in media creation and usage within the domains of software engineering and data science.
● Analyze a design problem, create a successful solution applying the principles of design processes and techniques, and report findings.
● Translate non-visual information into effective visual representations.

## AWS 400 - AWS Cloud Computing

Semester Units:   6
Prerequisite:       None

This cloud computing course aims to equip students with the essential skills and knowledge to understand the fundamental concepts of the Amazon Web Service Cloud and apply them in real-world scenarios. Additionally the course also covers fundamental Amazon Web Services (AWS) security concepts, including AWS access control, data encryption methods, and how to secure network access to AWS infrastructure. It will enable students to build skills and confidence while contributing to their organization's cloud initiatives.

Course Learning Outcomes
● Explain cloud concepts and components of cloud services
● Apply the process and techniques how to increase the performance efficiency and reduce costs of infrastructures built on AWS
● Evaluate and improve an existing AWS Cloud infrastructure by applying the design principles and pillars of the AWS Well-Architected Framework.
● Identify the characteristics of highly available and secure systems and networks
● Describe and identify networking designs that supports cloud application disaster recovery, and on-prem to cloud migration and connection
● Independently design architecture and deploy selected AWS services with proficiency, as evidenced by successfully launching and configuring a specified set of AWS services with greater flexibility and resilience within a given environment, to meet the AWS Well Architected Framework design pillars and principles and best practices.
● Explain AWS Cloud billing and cost optimization techniques
● Complete the AWS Cloud Practitioner and AWS Solutions Architect Associate certification examination

## BUS 200 - Business Finance

Semester Units:   3
Prerequisite:        ENT 100

Through the integration of technical proficiency, critical thinking, and global awareness, this course equips students with a versatile set of skills to navigate intricate financial management challenges and contribute to organizational success. Going beyond mere technical finance matters, the curriculum fosters problem-solving abilities essential for addressing real-world financial dilemmas.

Course Learning Outcomes
● Understand financial strategies that maximize shareholder value and evaluate financial risks and implement risk management techniques
● Interpret financial statements to assess a company's financial health and analyze financial data to make informed business decisions
● Evaluate the impact of economic variables on business operations and understand microeconomic and macroeconomic theories and their implications on business strategies
● Understand various investment vehicles and financial markets and analyze investment opportunities using various investment appraisal techniques
● Apply ratio analysis and financial metrics to assess liquidity, profitability, and solvency ratios of a business
● Assess investment opportunities and manage capital budgeting decisions.
● Understand the importance of ethical behavior and integrity in business finance
● Comprehend corporate governance principles and regulatory requirements to ensure transparency, accountability, and stakeholder protection

## COM 148 - Communication for Impact

Semester Units:   3
Prerequisite:        None

This course is designed to prepare students to not only use public speaking as an approach to deliver a message, but also to make a long-lasting impact and leave a powerful impression through their speech. Through study and speech assignments, students learn about concepts and models of communication, how to adapt a speech for different occasions and audiences, how to effectively support their ideas, how to apply their critical thinking skills in selecting and organizing materials in preparation for a speech, and how to utilize multimedia tools in presentations. Foundational to the process is learning how to maintain strong ethics in the preparation and delivery of impactful speeches and presentations.

Course Learning Outcomes
● Deliver effective speeches and presentations in a variety of public and business settings.
● Critically evaluate a topic and craft well thought-out messages that either inform, instruct, or persuade audiences.
● Practice effective public speaking skills including eye contact, hand gestures, vocal tone/variety, and avoidance of disruptive speaking.
● Develop and implement strategies to overcome speech anxiety.
● Explain effective verbal communication techniques in leadership and teamwork settings.

## DS 100 - Introduction to Data Science

Semester Units:   1
Prerequisite:     None

This course challenges conventional thinking and equips students with essential skills for success in today's dynamic world. It fosters creativity, innovation, and problem-solving through critical evaluation of paradigms. Students learn data analysis, business strategies, and tools, and develop proficiency in methodologies like the EGAD Framework and Agile principles. Cultivating programmatic thinking and problem-solving skills prepares students for success in their professional endeavors.

Course Learning Outcomes
- Challenge conventional thinking: Critically evaluate existing paradigms, assumptions, and approaches to problem-solving and decision-making, fostering creativity, innovation, and alternative perspectives.
- Recall the basic principles and foundations of data analysis, business strategy assessment, and the utilization of data tools and techniques in business contexts.
- Employ methodologies for data solution development: Collaborate in teams, apply problem-solving techniques, and manage projects throughout the product development lifecycle using frameworks such as the EGAD Framework and Agile principles.
- Utilize a robust toolkit for problem-solving: Apply problem-solving methodologies, structured thinking principles, and design thinking concepts to solve complex problems, approach diverse information types, cultivate reflective thinking skills, and effectively address problems.
- Apply programmatic thinking: Analyze problems, construct algorithms, and implement logical solutions using various tools such as algorithms, operators, flowcharts, pseudocode, and conditional statements, enabling them to tackle challenges in diverse domains effectively.

## DS 110 - Preparing Data

Semester Units:   3
Prerequisite:     DS 100

Preparing Data is a course crafted to empower students with vital skills in data manipulation, analysis, and visualization using Google Sheets. Across multiple modules and immersive projects, participants will immerse themselves in data governance principles, delve into sophisticated spreadsheet functions, and acquire proficiency in recognizing data patterns and relationships. From grasping the pivotal significance of data integrity to navigating through advanced data visualization tools, this course adopts a thorough approach to honing the craft of data handling and analysis. By the course's conclusion, students will be well-equipped to make informed decisions and adeptly tackle real-world challenges.

Course Learning Outcomes
- Develop essential data and spreadsheet skills necessary for effective data manipulation, analysis, and visualization using Google Sheets.
- Investigate access to safe and affordable drinking water, focusing on inequalities in service levels, to analyze real-world datasets and address social and environmental challenges related to water access.
- Explain the critical role of data in effective analysis and delve into data governance principles, ethics, and Google Sheets tools for data access and utilization.
- Develop proficiency in spreadsheet fundamentals and data management techniques, including essential terminologies, file formats, and proficiency in using Google Sheets.
- Grasp the importance of transforming raw data into actionable insights using spreadsheets and explore data visualization techniques for effective analysis.

## DS 120 - SQL for Data Science

Semester Units: 5
Prerequisite: DS 110

In this course, students will enhance their SQL skills and delve deep into database management. This course covers a wide range of topics essential for database professionals and data analysts. From utilizing control flow functions and database keys to grasping set theory and database normalization, students will gain a solid overview of SQL fundamentals. Through hands-on exercises and practical examples, students will learn how to effectively use conditional logic for dynamic data retrieval and manipulation, establish relationships between tables using database keys, and optimize query performance and readability with advanced SQL techniques like subqueries and Common Table Expressions (CTEs). Additionally, students will explore set theory in SQL databases, create SQL views for streamlining data access, and gain insights into various database systems, including NoSQL databases. By the end of the course, students will have the skills and expertise to handle complex database management tasks with confidence, making them a valuable asset in any data-driven organization.

Course Learning Outcomes
- Implement control flow functions in SQL queries, facilitating dynamic data retrieval and manipulation through conditional logic.
- Utilize database keys to ensure data integrity and establish effective relationships between tables.
- Apply set theory in SQL databases, employing key set operators to combine and manipulate query results effectively.
- Utilize advanced SQL techniques, including subqueries and Common Table Expressions (CTEs), for optimizing query performance and readability.
- Identify the significance of SQL views as virtual tables, simplifying data access, enhancing query performance, and improving data security.
- Apply principles of database normalization (1NF, 2NF, and 3NF) to enhance data integrity and address anomalies in relational databases.
- Acquire comprehensive insights into various database systems, including NoSQL databases, to make informed decisions in data storage and retrieval strategies.

## DS 130 - Data Visualisation

Semester Units: 6
Prerequisite: DS 120

This course teaches participants storytelling, communication, design, visualization, dashboards and reports for data. Participants will use Microsoft Power BI to build data models, create new features, and craft interactive dashboards and reports that will enable them to convey insights, provide actionable recommendations, foster collaboration, influence stakeholders, engage others in the data process, and build trust. It covers data modeling, DAX calculations, report and dashboard design, and data transformation techniques. The course covers the basics of importing, connecting, and managing data from various sources, executing complex calculations, and creating interactive reports and dashboards. It also covers Exploratory Data Analysis (EDA), analyzing data patterns and identifying trends. The course emphasizes practical application and real-world scenarios, ensuring participants develop the skills and confidence to tackle data analysis challenges in their professional roles.

Course Learning Outcomes
- Explain the significance of formatting in data visualization and storytelling, and presentation design in conveying information effectively.
- Create and utilize calculated columns in Power BI using Data Analysis Expressions (DAX) to execute complex data calculations and enhance reporting capabilities.
- Describe the various ways in which aggregation can be achieved in Power BI.
- Discuss the design principles and practices of creating effective reports and dashboards.
- Describe Exploratory Data Analysis (EDA) and know the key approaches to gain insights into data.
- Identify the key components of a data story and their relevance in data analysis and communication.
- Apply effective communication techniques to convey insights derived from data analysis.
- Evaluate the effectiveness of different data visualization methods in conveying complex information.

## DS 200 - Python for Data Scientists I

Semester Units:   4
Prerequisite:     DS 130

In this course, students will explore the versatile realm of Python programming, an essential language for various applications, from web development to data science. Python's readability and extensive libraries make it a powerful tool for both beginners and experienced developers. Throughout this course, students will delve into the core principles of Python, covering topics such as syntax, data structures, and control flow. By the end, students will be equipped with the skills to write efficient and scalable Python code for a wide range of purposes.

Course Learning Outcomes
- Apply Python's key characteristics, advantages, and historical significance proficiently through effective utilization of Jupyter Notebook, Google Colab, and essential Python tools for coding tasks, variable assignment, data types, and data structures.
- Apply logic and loops proficiently in Python, utilize Visual Studio Code (VSCode) for efficient coding, and create and use functions effectively, ensuring proper variable scope management, to implement basic Python functions for essential programming tasks.
- Understand and apply concepts of computational complexity, Big O notation, search and sort algorithms, recursive and lambda functions, and implement these concepts to solve practical problems and optimize algorithmic design.
- Instantiate classes in Python, implementing core object-oriented programming (OOP) concepts like encapsulation, inheritance, polymorphism, and abstraction, to create modular and reusable code structures, and utilize classes and objects proficiently in Python.
- Implement best practices for imports, indentation, comments, docstrings, and naming conventions in Python programming, producing clean code that conforms to the PEP 8 guidelines, maintaining consistency, readability, and enhancing code comprehension and maintainability.

## DS 210 - Python for Data Scientists II

Semester Units:   5
Prerequisite:     DS 200

Building on top of existing Python skills, this course covers essential topics in data science and software development, providing participants with a deep mastery of modularization, data manipulation, visualization, statistical analysis, and software testing. Through hands-on exercises, participants will master Python modules, NumPy for data manipulation, Pandas for data handling, Matplotlib for data visualization, and statistical methods for hypothesis testing. Additionally, they will learn about software testing concepts and techniques, including debugging, and develop proficiency in creating, distributing, and version controlling Python packages using Git and GitHub. By the course's end, participants will possess the skills and knowledge needed to excel in Python programming for data science and software development.

Course Learning Outcomes
- Implement the fundamentals of modularization in Python programming, including the creation and utilization of Python modules.
- Develop proficiency in using NumPy for data manipulation and analysis, including loading, reshaping, and manipulating arrays.
- Utilize Pandas for efficient data handling, manipulation, and analysis, including working with DataFrames, sorting, filtering, and applying transformations.
- Utilize regular expressions and their integration with Pandas for advanced string operations within Python data structures.
- Produce complex visualizations using Matplotlib, incorporating customized features and applying advanced plotting techniques to convey insights effectively.
- Apply statistical methods in Python for data analysis, hypothesis testing, and interpreting results effectively.
- Recognize the importance of testing in software development and demonstrate proficiency in software testing concepts, techniques, and debugging.
- Develop proficiency in the creation, distribution, and version control of Python packages using Git and GitHub for wider accessibility and usage.

# DS 300 - Techniques for Regression Analysis

Semester Units:   6
Prerequisite:      DS 210, QNT 102

This course offers a thorough exploration of regression analysis, starting from the fundamental principles of least squares to advanced techniques in model optimization and ensemble methods. Students will acquire expertise in modeling relationships between variables using least squares, describing the significance of the line of best fit in regression modeling. Extensive coverage of data preparation techniques such as test/train split and cross-validation ensures accurate model evaluation and generalization. The course delves into both simple and multiple linear regression, including multidimensional modeling and model evaluation through residual analysis. Additionally, participants will learn various methods for variable selection and model optimization, including regularization techniques like LASSO and Ridge regression. Decision tree algorithms, ensemble methods, and random forests will be thoroughly explored for predictive modeling. By the course's end, students will possess the skills to construct robust regression models, make informed predictions, and responsibly utilize cloud resources for scalable computing.

Course Learning Outcomes
- Apply regression analysis principles, data preparation techniques, SLR and MLR differentiation, model optimization methods, decision tree algorithms, and cloud infrastructure skills for predictive modeling.
- Implement essential techniques for data and model preparation, including test/train split, cross-validation, and variable selection methods.
- Differentiate between simple linear regression (SLR) and multiple linear regression (MLR), exploring MLR in 2D and 3D spaces, and analyzing MLR results to evaluate model performance.
- Explore and apply techniques for model optimization, including encoding dummy variables, handling categorical data, and implementing regularization methods such as LASSO and Ridge regression.
- Practice implementation of decision tree algorithms, ensemble methods, and random forests, evaluating their workings, differences, and applications in predictive modeling.

# DS 320 - Natural Language Processing and Classification

Semester Units:   6
Prerequisite:      DS 300

In this course, students will discover the essential tools and techniques for effective machine learning model development.  Students will learn the importance of version control in managing code iterations and delve into ML platform tools for efficient experiment tracking, and gain advanced skills in the art of text preprocessing, including noise removal and feature extraction using N-grams and Bag of Words. Students will explain binary classification theory and implement logistic regression using sklearn and explore performance metrics like accuracy, precision, and recall, with a focus on handling class imbalance. Students will delve into feature selection and hyperparameter tuning for optimal model performance, explore a range of advanced classification models, and learn to fine-tune them using techniques like grid search. This course intends for students to be equipped to build, evaluate, and select the best classification models for their projects.

Course Learning Outcomes
- List the principles and importance of version control in managing code and project iterations.
- Utilize ML platform tools for experiment tracking and management.
- Describe text cleaning techniques, including noise removal, tokenization, stemming, and lemmatization.
- Apply methods such as N-grams and Bag of Words to extract features from text.
- Differentiate binary classification from regression tasks and comprehend their concepts and theory.
- Compare logistic regression to linear regression, including theory and practical implementation using sklearn.
- Assess the performance of binary classifiers, especially in the presence of class imbalance.
- Identify key metrics such as accuracy, precision, recall, and F1-score for evaluating classifier performance.

## DS 400 - Unsupervised Learning Methods

Semester Units:   6
Prerequisite:       DS 320

Unsupervised Learning Methods is an all-encompassing course aimed at providing students with a comprehensive outline of unsupervised learning methods and their practical applications. Through a combination of theoretical lectures, hands-on exercises, and real-world projects, students will explore key concepts such as dimensionality reduction, clustering, and recommender systems. The course covers a wide range of topics, including principal component analysis (PCA), multidimensional scaling (MDS), t-distributed stochastic neighbor embedding (t-SNE), K-means clustering, hierarchical clustering, Gaussian mixture models (GMMs), and recommender systems, all of which are implemented using Python and popular machine learning libraries. By the course's end, students will have the skills to uncover hidden patterns and structures in unlabelled data, enabling them to extract valuable insights and make informed decisions in various domains.

Course Learning Outcomes
● Describe unsupervised learning concepts and their real-world applications.
● Master dimensionality reduction techniques and their respective benefits.
● Explain the principles of principal component analysis (PCA) and its practical implementation.
● Execute PCA in Python to achieve dimensionality reduction effectively.
● Investigate advanced dimensionality reduction methodologies such as multidimensional scaling and t-SNE.
● Employ dimensionality reduction techniques on image data for comprehensive analysis and visualization.
● Design and optimize recommender systems by employing both content-based and collaborative filtering approaches.
● Explain various clustering methodologies, including KNN, GMM, and Hierarchical, and implement them accordingly.

## DS 440 - Portfolio Review

Semester Units:   3
Prerequisite:       None

This intensive course prepares students for careers in data science by covering SQL database management, Python data analysis using Pandas, and data visualization with Power BI. Students master techniques for manipulating databases, conducting advanced data analysis, and creating insightful visualizations. Emphasis is placed on evaluating machine learning proficiency, including regression, classification, model interpretation, and algorithm application such as linear regression, logistic regression, decision trees, random forests, and support vector machines. Through real-world data science challenges, students hone their problem-solving skills, culminating in the creation of a polished resume showcasing their readiness for the field. By the course's end, students emerge as skilled data practitioners with the expertise and portfolio necessary for success in the data science industry.

Course Learning Outcomes
● Present, reflect, and iterate on a portfolio of data science challenges and solutions which demonstrate career readiness.
● Create a resume that demonstrates career readiness.
● Exhibit entry-level readiness by completing tasks related to SQL database management, Python data analysis using Pandas, data visualization with Power BI, database manipulation, data analysis, and the creation of insightful visualizations.
● Exhibit entry-level career readiness by demonstrating machine learning proficiency, emphasizing regression, classification, interpretation of model parameters, evaluation metrics, and the application of algorithms including linear regression, logistic regression, decision trees, random forests, and support vector machines.

## ENT 100 - Foundations of Entrepreneurship

Semester Units:    12
Prerequisite:       None

This course is designed to give emerging leaders a holistic foundation to the knowledge, skills, behaviors, and values that underpin acts of innovation and entrepreneurship. Blending the development of emotional intelligence, entrepreneurial thinking, critical analysis, project management, effective communication, and technology literacy, the course serves as a survey to the sectors and practices of the 21st century innovation economy.

Course Learning Outcomes
● Recall and develop strategies to manage emotions and behaviors, confronting challenges with resilience and leveraging real-world experiences for continuous growth.
● Recall and develop strategies to apply empathy and understanding of diverse perspectives, fostering collaboration, feedback, inclusive environments.
● Apply entrepreneurial thinking to discover innovative solutions, addressing complex problems while embracing creativity and continuous improvement.
● Utilize data contextualization, empirical research, and quantitative problem-solving techniques to make data-based decisions in real-world scenarios.
● Employ effective project management techniques to approach complex tasks from multiple perspectives, ensuring successful execution.
● Communicate ideas effectively by considering audience awareness, utilizing the writing process, voice, organization, and storytelling skills.
● Critically examine facts, avoid assumptions, and develop evidence-based solutions using authentic inquiry and research analysis.
● Identify and describe several sectors of the technology ecosystem, while identifying and explaining how those sectors utilize specialized tools and specialized tracks, development of technical literacy, and exploration of ethics in the field.
● Engage with a comprehensive understanding of the tech ecosystem, including collaboration, proficiency with tools, technical literacy, and ethical considerations.

## ENT 110 - Introduction to Venture Creation

Semester Units:    3
Prerequisite:       ENT 100

This course equips university students with a fundamental knowledge of the entrepreneurial journey and the necessary skills for launching and managing a successful business venture. Through engaging lectures, practice exercises, and real-world applications, students will identify and explore the skills needed to go through the venture creation process, from ideation to implementation.

Course Learning Outcomes
● Explain the entrepreneurial mindset, how it fosters creativity, and how it utilizes a unique approach to problem-solving.
● Identify and assess market opportunities, conducting basic market research, and evaluating the viability of their venture ideas in relation to existing market conditions.
● Simulate a new venture, from idea generation and opportunity identification to business planning, prototyping, and pitching
● Utilize relevant technology tools to conceptualize, design, and implement the innovative ideas into tangible, user-centric solutions for real-world challenges.
● Create a pitch deck to present venture ideas, including the problem statement, solution, market potential, and business model.

## ENT 300 - Ethics and Technology

Semester Units:   3
Prerequisite:       None

This course teaches the philosophy, principles, conceptual tools, and moral vocabulary of ethics in technology in the 21st century. It covers the promise and impact of technology on individuals and organizations, the role of ethics in technology, including the responsibilities of individuals and organizations in the development of data, analytics, and AI, and the categorization and risk of ethical issues associated with technology. The course equips students to investigate and analyze the ethical dilemmas associated with data, analytics, and AI through an understanding of technological and algorithmic bias, privacy, discrimination and fairness, and the reliable measurement of accuracy. Emphasis is placed on fostering critical thinking and ethical decision-making skills to navigate the evolving landscape of technology in a responsible and socially conscious way.

Course Learning Outcomes
- Explain the philosophical underpinnings of ethics in technology, tracing the historical development and evolution of ethical principles in response to technological advancements.
- Assess the promises and impacts of technology on individuals and organizations, critically examining the ethical dimensions of technological advancements.
- Describe the role and responsibilities of individuals and organizations in the ethical development and deployment of data, analytics, and AI technologies.
- Identify, evaluate, and categorize the ethical issues associated with technology, including but not limited to technological and algorithmic bias, privacy concerns, discrimination, and fairness.
- Develop an understanding of technological and algorithmic bias and its implications, and explore strategies to mitigate bias in technological systems.
- Investigate the ethical dimensions of privacy in the digital age, exploring the tension between data collection and individual privacy rights.
- Critically analyze issues of discrimination and fairness in the design and implementation of technology, and explore approaches to promote equity.
- Understand the importance of accurate measurement in technology, exploring methods to ensure the reliability and fairness of algorithms and analytical processes.
- Develop critical thinking skills to effectively evaluate and respond to evolving ethical challenges in the realm of data, analytics, and AI, promoting responsible and ethically sound decision-making.

## ENT 310 - Leadership and Management

Semester Units:   3
Prerequisite:       None

This course equips future technical professionals with the essential leadership and management skills needed to thrive in today's dynamic technology landscape. Through engaging learning materials, interactive exercises, and real-world case studies, students will explore crucial topics such as team dynamics, communication strategies, project management, and strategic thinking, specifically applied to technical areas like Software Engineering, Data Analytics, Salesforce, and AWS Cloud Computing. By the end of the course, students will be able to effectively lead, motivate, and collaborate with diverse teams to achieve successful outcomes in technical projects and endeavors.

Course Learning Outcomes
- Analyze the unique leadership and management challenges faced in technical environments.
- Apply fundamental leadership theories and principles to motivate and guide technical teams.
- Develop effective communication strategies for cross-functional collaboration in technical projects.
- Implement project management frameworks to ensure efficient resource allocation and delivery.
- Apply critical thinking and problem-solving skills to navigate complex technical scenarios.
- Describe a culture of innovation and continuous learning within technical teams.

## ENT 400 - Special Topics

Semester Units:   3
Prerequisite:      None

ENT 400 delves into special topics critical to the field of technology and entrepreneurship. Special Topics: Artificial Intelligence and Machine Learning will broaden and deepen knowledge and encourage critical thinking, research and understanding of upcoming and more advanced technologies while also providing necessary scope of the AI/ML Lifecycle. The course will explore cutting-edge research, methodologies, and technologies, and challenges students to critically analyze and implement solutions through hands-on coding exercises, case studies and a final capstone project.

Course Learning Outcomes
- Define key concepts, methods and technologies in advanced AI, big data, data science, and machine learning
- Identify and Analyze Emerging Trends in AI. Define current trends and their impact in various business verticals.
- Analyze and Evaluate current trends and relevance to a particular context/problem.
- Critically evaluate AI Research and Applications, understanding the AI/ML lifecycle. Develop and employ critical thinking skills in a research proposal and capstone project

## PE 101 - Intro to Personal Effectiveness

Semester Units:   1
Prerequisite:      None

This course guides students through the essential strategies for success in both academic and personal arenas. This course emphasizes the formulation of SMART goals, the application of ethical principles in academic contexts, and the development of effective stress management techniques. Through a series of interactive assessments including reflective essays, personalized plans, and group discussions, students will gain the skills necessary to navigate and thrive within an academic environment, laying a solid foundation for future professional growth.

Course Learning Outcomes
- Formulate SMART goals for personal, academic, and professional development, ensuring they are Specific, Measurable, Achievable, Relevant, and Time-bound.
- Explain the foundation of ethics in the context of an academic environment, focusing on the principles of academic integrity and how to apply ethical decision-making in learning scenarios.
- Develop and implement strategies to effectively manage stress and pressure, incorporating time management, mindfulness, and coping mechanisms.

## PE 301 - Applied Personal Effectiveness

Semester Units:   1
Prerequisite:      PE-I

This course is tailored for students beginning their transition from academia to the workforce, focusing on what it means to be an effective team member and contributor. This course delves into the interpersonal dynamics of the workplace, group and team behavior, digital literacy, and the significance of networking in career development. Through engaging assessments such as online discussions, case study analyses, and strategic planning exercises, students will learn to navigate workplace relationships, contribute positively to team dynamics, critically assess digital information, and utilize networking for professional growth. PE 301 equips students with the practical skills and insights needed to thrive in the professional world, fostering a smooth and successful transition from student to professional.

Course Learning Outcomes
- Explain the dynamics of interpersonal relationships in the workplace, including the nuances of being an employee or contractor, managing upward, and setting behavioral expectations within a growth mindset framework.
- Analyze and describe group and team behavior in professional settings, highlighting the characteristics of effective team contributions and the impact of individual behavior on team success.
- Critically assess digital information, distinguishing between credible information, misinformation, and disinformation, and demonstrate the application of digital literacy skills in professional contexts.
- Discuss and demonstrate the value of networking for career development, incorporating practical exercises in building and leveraging professional connections.

## PE 401 - Personal Effectiveness for Career Readiness

Semester Units:   3
Prerequisite:      PE-II

This course is designed to polish final-year students' readiness for the professional world, focusing on exhibiting the behaviors of a true professional. This course covers building a professional online identity, creating essential communication tools such as resumes and professional email addresses, mastering interview techniques, and understanding the significance of ongoing professional development. Through targeted assessments, including the creation of professional online profiles, resume and cover letter writing workshops, recorded mock interviews, and the development of a personal branding strategy, students will not only showcase their strengths and goals but also refine their ability to communicate professionally. The course culminates in the creation of a comprehensive professional development plan, ensuring students are prepared to embark on their career paths with confidence and a clear direction for their continued growth in their chosen fields.

Course Learning Outcomes
- Develop and present a professional online identity, showcasing personal strengths, professional goals, and a coherent professional narrative suitable for public viewing.
- Create professional communication tools, including a tailored resume, a professional email address, and the use of appropriate email tone, adhering to standard business communication practices.
- Demonstrate readiness for job interviews through participation in mock interviews, exhibiting professional demeanor, strategic question response techniques, and effective communication skills.
- Illustrate the importance of and create a plan for continued professional development, identifying future learning opportunities, setting professional growth goals, and outlining steps to achieve them.

## QNT 101 - College Algebra

Semester Units:   3
Prerequisite:     None

This course is a foundational university course designed to equip undergraduates with essential algebraic skills necessary for success in higher-level mathematics, software engineering and data science disciplines. Delving into the core principles of algebra, this course provides a structured learning experience that progresses through key concepts, from fundamental arithmetic to advanced functions and beyond.

Course Learning Outcomes
- Utilize exponent rules to simplify expressions and convert numbers into scientific notation.
- Evaluate and simplify expressions involving radicals and rational exponents.
- Factor polynomials and solve polynomial equations using various methods.
- Solve linear equations and inequalities in one and two variables, and interpret solutions in context.
- Utilize graphical and algebraic methods to solve quadratic equations and interpret their solutions.
- Model real-world phenomena using linear, polynomial and rational functions and interpret the parameters within the context of the problem.
- Analyze exponential and logarithmic functions, including graphing and solving equations involving these functions.
- Evaluate real world problems to model and then solve systems of linear non-linear equations using appropriate techniques.
- Identify and analyze arithmetic and geometric sequences,including sequence notations and their proper use.

## QNT 102 - Statistics

Semester Units:   3
Prerequisite:     None. QNT 101 Recommended.

This course provides students with a foundational understanding of statistical concepts and techniques essential for data analysis across various disciplines. This course is designed to introduce students to the principles of descriptive and inferential statistics, enabling them to analyze and interpret data effectively. Through interactive learning experiences and practical applications, students develop the skills necessary to make informed decisions based on statistical evidence.

Course Learning Outcomes
- Analyze data distributions using statistical measures to identify outliers and estimate probabilities.
- Apply various probability models, including Binomial and Poisson distributions, to predict outcomes and model events.
- Formulate hypotheses and use statistical tests to evaluate them, integrating the Central Limit Theorem for accurate inference.
- Apply statistical methods to construct confidence intervals and ensure the reliability of inferences.
- Use statistical tests to assess relationships and compare variances between datasets.
- Interpret and apply statistical results to make informed decisions in real-world scenarios.

## QNT 105 - Foundations of Data Analysis and Decision Making

Semester Units:   3
Prerequisite:       QNT 102

This foundational university course in data analysis and decision making equips undergraduate students with the essential skills and mindset required to harness data for informed, logical, and data-driven decision-making. Through a blend of theory, hands-on exercises, and practical application, students will develop the core competencies needed to extract insights from data, test hypotheses, and solve complex problems. The course spans 135 hours, incorporating classroom instruction, individual and group assignments, and guided analytical projects.

Course Learning Outcomes
- Explain the importance of data-driven decision making in various contexts.
- Apply logical thinking and guesstimates to make informed estimates and predictions.
- Apply techniques to effectively structure and visualize data for analysis.
- Conduct hypothesis testing and interpret results.
- Analyze data using statistical techniques, including linear regression, to make data-driven predictions.
- Apply basic and inferential statistics in the decision-making process to develop optimal decisions.
- Evaluate problems for effective solutions using an analytical approach.
- Create effective communication for data-driven insights.

## SCI 200 - Introduction to Climatology, Ecology, and Human Impact

Semester Units:   3
Prerequisite:       QNT 102

This course is designed to provide a comprehensive understanding of sustainability concepts and methodologies, essential for tackling the dual crises of climate change and biodiversity loss. The aim is to equip participants with the knowledge and skills necessary for effective sustainability efforts and to cultivate an appreciation for the complex interactions between climate change and ecosystem dynamics. By participating in this course, you will be prepared to contribute significantly to overcoming environmental challenges. You will also understand the crucial interplay between climate change and ecosystem dynamics, positioning you to play a vital role in our collective pursuit of a sustainable future.

Course Learning Outcomes
- Describe the principles of climate science, including the greenhouse effect, global warming, and key climate change metrics, to form a foundation for further study in climatology and ecosystem dynamics.
- Identify and explain the dynamics of ecosystems, detailing the interactions between biotic and abiotic factors, and evaluate how ecosystems react to external stressors and climate change.
- Analyze the relationship between human activities and climate change, examining socio-economic factors that drive climate-impacting behaviors and assessing the effectiveness of carbon reduction strategies.
- Classify ecosystem services and assess their economic value, acknowledging their importance to human well-being, to support evidence-based decision-making in conservation and sustainable resource management.
- Evaluate the complexity of socio-ecological systems, with a focus on adaptive capacity, to devise strategies that enhance ecosystem resilience and sustainability in the face of climate change.
- Design and implement sustainability principles in conservation practices, balancing ecological, social, and economic needs to encourage enduring environmental stewardship and sustainable natural resource use.

## SE 101 - Introduction to Computing

Semester Units:   3
Prerequisite:      None

This course is an introductory course that provides students with a comprehensive foundation in software engineering, encompassing its core principles, significance, and practical applications. Through a combination of theoretical learning and hands-on exercises, students will delve into various aspects of software development, including basic computer architecture, version control systems, programming logic, and problem-solving techniques. By the end of the course, students will be equipped with the essential knowledge and skills to embark on further study and application in the field of software engineering.

Course Learning Outcomes
- Recall and explain the foundations of software engineering, including its significance, principles, and an overview of the software development life cycle (SDLC), preparing for further study and application in the field.
- Recall and explain the basics of computer architecture, learning about components such as memory and processors, and demonstrate understanding of the fundamentals of operating systems and file systems.
- Describe the essentials of version control systems, particularly Git, to understand their role in software development for effective code storage, collaboration, and version tracking.
- Apply fundamental programming logic and concepts, focusing on language-agnostic approaches to data types, variables, data structures, loops, conditionals, and functions.
- Apply basic problem-solving and debugging skills through the application of logical strategies and techniques, improving the ability to approach and resolve programming-related problems effectively.
- Create and execute simple programs using Scratch, applying knowledge of programming logic and concepts, and demonstrating an understanding of flowcharts, pseudocode, and basic algorithmic thinking.

## SE 102 - Foundations of Linux and Version Control

Semester Units:   3
Prerequisite:      None

This course provides comprehensive training in Linux command-line interfaces, shell scripting, and Git version control systems, emphasizing efficient system navigation, task automation, and project management while ensuring data integrity and security. Students apply Linux command-line operations, file permissions, and security mechanisms before advancing to Git version control, where they learn repository management and collaboration techniques. Practical exercises reinforce skills in project tracking, team collaboration, and code quality maintenance through advanced Git features and workflows.

Course Learning Outcomes
- Apply knowledge of Linux command-line interfaces and shell scripting to perform various tasks such as file navigation, manipulation, task automation, and system process management effectively.
- Demonstrate an understanding of Linux file permissions and security mechanisms, enabling them to protect data and manage access control within a Linux environment effectively.
- Apply knowledge of Git version control to initialize repositories, track changes, and collaborate on software projects, effectively managing version history.
- Apply knowledge of Git and GitHub to work collaboratively on projects, employing best practices for branching, merging, resolving merge conflicts, and contributing through pull requests and code reviews.
- Evaluate and apply advanced Git features and workflows, including branching strategies, rebasing, and working with remote repositories, to effectively manage complex software development projects.

## SE 103 - Essential Tools and Mindsets for Software Engineers

Semester Units: 2
Prerequisite: None

This course equips students with essential software engineering tools for efficient code navigation and manipulation. Emphasis is placed on the significance of cultivating and sustaining a professional network, recognizing its pivotal role in career advancement within software engineering. Students also grasp the concepts of grit and growth mindsets, applying these principles to drive personal and professional growth in the field. Additionally, proficiency is attained in utilizing key communication and collaboration tools such as Discord, fostering effective team interaction and project management in software engineering contexts.

Course Learning Outcomes
- Acquire mastery in essential software engineering tools, ensuring the ability to navigate and manipulate code efficiently.
- Learn the importance of building and maintaining a professional network, understanding how connections can contribute significantly to career development and opportunities in software engineering.
- Grasp the concepts of grit and growth mindsets, and apply these principles to foster personal and professional development in the field of software engineering.
- Gain proficiency in using key communication and collaboration tools like Discord, understanding their role in effective team interaction and project management within a software engineering context.

## SE 200 - C Programming I

Semester Units: 5
Prerequisite: SE 102

This course is essential for undergraduate learners seeking a solid foundation in low-level programming with the C language. By deep exposure and practice of fundamental concepts and advanced techniques such as memory management and dynamic allocation, students gain the skills necessary for developing efficient and robust software solutions. Through hands-on exercises and real-world applications, this course equips students with problem-solving abilities crucial for success in diverse computing environments, from software development to system programming and embedded systems. By enrolling in Low Level Programming I, students will acquire the expertise needed to excel in their academic and professional pursuits within the field of computer science.

Course Learning Outcomes
- Create simple C programs by synthesizing fundamental programming concepts. Fulfill specified requirements by applying knowledge and understanding of syntax, data types, and control structures.
- Analyze the roles and interactions of pointers, arrays, and strings in memory management. Implement these concepts in C programming, showcasing the ability to manipulate memory effectively.
- Analyze complex programming problems and devise solutions using advanced C concepts. Employ creativity and problem-solving skills to create solutions incorporating nested loops, recursion, and static libraries to address intricate programming challenges.
- Evaluate and debug C programs by identifying and resolving errors using systematic debugging techniques. Enhance problem-solving abilities by effectively identifying and rectifying programming errors.
- Apply dynamic memory management techniques in C programming, including Malloc and Free. Analyze the impact of these techniques on program performance and efficiency, demonstrating the ability to optimize memory usage effectively.
- Employ preprocessor directives and handle command line arguments in C programs. Evaluate the uses and implications of these techniques for enhancing program flexibility and user orientation, showcasing the ability to design more versatile and user-friendly C programs.

## SE 201 - Data Structures and Algorithms I

Semester Units:    3
Prerequisite:    SE 200, QNT 101

Data Structures and Algorithms I is a foundational undergraduate course aimed at developing students' problem-solving skills and algorithmic thinking in computer science. Through a blend of theory and practical exercises, students will explore how to effectively utilize data structures to solve complex problems and understand the rationale behind choosing specific structures for efficiency and suitability. By applying algorithmic thinking to manipulate data within these structures, students will enhance their abilities in data organization and retrieval. This course is essential for learners aspiring to excel in fields like software development, data science, and artificial intelligence, providing a solid foundation for problem-solving and algorithmic principles crucial in these domains.

Course Learning Outcomes
- Students will refine their problem-solving abilities through the creation of algorithms that leverage various data structures. By applying critical thinking and analytical skills, they will develop solutions to intricate problems, reinforcing their competency in algorithmic design.
- Students will exhibit comprehension of the rationale behind selecting specific data structures for problem-solving scenarios. Through evaluation, they will assess the effectiveness and appropriateness of chosen data structures based on criteria such as efficiency and suitability for the given problem.
- Students will employ algorithmic thinking to manipulate and manage data within various data structures. By solving problems related to data organization and retrieval, they will demonstrate their ability to apply algorithmic principles in practical contexts, fostering proficiency in data manipulation.

## SE 202 - High Level Programming I

Semester Units:    5
Prerequisite:    SE 200

This course covers essential programming concepts and software development practices. Students learn fundamental syntax, modular programming, object-oriented concepts, and test-driven development. Through hands-on exercises, they gain practical skills for building robust and maintainable code.

Course Learning Outcomes
- Apply fundamental programming syntax and control structures, such as conditional statements and loops.
- Effectively use modular programming techniques, including the use of libraries and exception handling, to build robust and maintainable code.
- Evaluate the use of object-oriented programming concepts, including classes, objects, and inheritance, in designing software
- Apply test-driven development practices, learning to write tests that guide the coding process and effectively evaluate the robustness and functionality of their code.

## SE 203 - Application of Programming Concepts I

Semester Units: 3
Prerequisite: SE 202

This course offers a comprehensive journey in web application development, covering front-end and back-end practices, database integration, object-oriented programming principles, software testing fundamentals, and critical thinking. Students will learn to analyze problems, engineer solutions, and tackle real-world challenges, preparing them to navigate the complex landscape of web application development confidently.

Course Learning Outcomes
- Develop web applications from concept to deployment, incorporating both front-end and back-end development practices, and using appropriate tools and technologies.
- Integrate databases with web applications, analyzing the role of databases in storing, retrieving, and managing application data effectively.
- Analyze problems and create solutions using object-oriented programming principles, demonstrating an understanding of encapsulation, inheritance, and polymorphism in application development.
- Apply the principles of software testing by implementing test cases to evaluate and ensure the reliability and functionality of their applications.
- Demonstrate critical thinking and problem-solving skills by analyzing requirements, designing solutions, and evaluating their effectiveness in addressing real-world challenges.

## SE 300 - High Level Programming II

Semester Units: 4
Prerequisite: SE 202

In this course, students will embark on an immersive journey into the realm of advanced web development, focusing on harnessing the power of JavaScript to create dynamic and interactive web applications. Through a combination of theoretical understanding and hands-on practice, students will delve into various aspects of client-side web technologies, programming libraries, and best practices.

Course Learning Outcomes
- Utilize JavaScript programming libraries to enhance web development projects, applying best practices to create dynamic, interactive web applications.
- Apply their knowledge of Javascript to manipulate the Document Object Model (DOM), enhancing user interaction and experience for client-side web technologies.
- Implement advanced programming features such as objects, scopes, closures, and asynchronous programming, analyzing their use cases and impact on application functionality and performance.
- Programmatically acquire, manipulate, and process data from various sources using API requests, and understand how to parse and utilize JSON data effectively, demonstrating proficiency in reading and writing data to files.

## SE 301 - Storage and Databases

Semester Units:   3
Prerequisite:      SE 202

Students will delve into the heart of data management in this course. Students will grasp the foundational principles of data storage, learning how relational databases organize, index, and retrieve data. Through practical exercises, they'll apply best practices in database design and management, ensuring data integrity, security, and efficient handling. With a focus on SQL, students will develop proficiency in crafting complex queries to extract, update, and organize data effectively. Armed with these skills, they'll analyze database data to generate insightful reports, empowering data-driven decision-making.

Course Learning Outcomes
- Explain the underlying principles of data storage, including how data is organized, indexed, and retrieved in relational databases.
- Apply best practices in database design and management, ensuring data integrity, security, and effective data handling.
- Analyze database data to create meaningful reports and insights, using SQL queries to support data-driven decision-making.
- Design and implement complex SQL queries, analyzing their use in extracting, updating, and organizing data effectively in a database.

## SE 302 - Application of Programming Concepts II

Semester Units:   4
Prerequisite:      SE 203

Students begin to unlock the world of web application development in this intensive course. Students will design and implement applications with web frameworks, creating RESTful APIs, and crafting dynamic interfaces. They'll apply advanced programming principles to build complex, industry-standard applications. By course end, students will be equipped to develop scalable, maintainable, and high-performing web solutions.

Course Learning Outcomes
- Design and implement applications using web frameworks, understanding the framework's structure, conventions, and best practices to develop scalable and maintainable web applications.
- Create RESTful APIs, analyzing how these APIs facilitate communication between the client and server by transmitting data over HTTP in a stateless, client-server, cacheable communications protocol
- Create dynamic web applications that respond to user input in real-time, evaluating the use of client-side scripting, server-side applications, and database interactions to enhance user experience
- Apply advanced programming principles and patterns in the context of web development, creating complex applications that follow industry standards for code quality, security, and performance.

## SE 303 - Integrated Software Engineering Project

Semester Units:   4
Prerequisite:       SE 200 or SE 201 or SE 203 or SE300

This course guides students in executing a comprehensive project, integrating diverse software engineering skills. Students conduct research, develop a minimum viable product (MVP), and effectively communicate project details.

Course Learning Outcomes
● Design and execute a comprehensive project that demonstrates their ability to apply and integrate knowledge and skills from various areas of software engineering, including research, planning, development, and implementation.
● Conduct in-depth research and analysis to validate their project concept, including evaluating existing solutions, technologies, and methodologies relevant to their project goals.
● Develop a minimum viable product (MVP) that addresses a specific problem or need, applying best practices in software development, project management, and user experience design.
● Effectively communicate the objectives, development process, challenges, and outcomes of their project through a comprehensive presentation and written documentation.

## SE 304 - C Programming II

Semester Units:   4
Prerequisite:       SE 200

This course is designed to advance students' proficiency in C programming and software development through a comprehensive exploration of advanced topics and practical applications. By the end of the course, students will have mastered a range of advanced C programming constructs and techniques, equipping them with the skills necessary to develop complex and efficient software solutions.

Course Learning Outcomes
● Apply advanced C programming constructs such as structures, typedef, and function pointers to create complex programs. Through analysis, evaluate the efficiency and effectiveness of these constructs in solving programming challenges.
● Develop variadic functions in C to handle flexible arguments. Evaluate the effectiveness of variadic functions in different scenarios, enhancing problem-solving abilities through critical analysis.
● Design and implement a custom printf function in C, integrating various concepts such as string handling, variadic functions, and memory management.
● Apply bit manipulation techniques in C programming. Analyze the applications of these techniques, particularly in optimizing memory usage and processing efficiency, demonstrating a deep understanding of their significance in software development.
● Gain proficiency in utilizing dynamic libraries and creating Makefiles in C programming,understanding the roles of dynamic libraries and Makefiles in modular programming and efficient project management.
● Implement file input/output operations in C-based applications. Through analysis, examine the importance of file I/O operations in data management and processing, gaining insights into their practical significance.

## SE 305 - Data Structures & Algorithms II

Semester Units:    2
Prerequisite:        SE 201

In this course, students will embark on a comprehensive exploration of algorithmic analysis and design, focusing on synthesizing theoretical knowledge with practical problem-solving skills. Through a combination of theoretical lectures, hands-on exercises, and real-world applications, students will delve into the intricacies of algorithm performance evaluation, optimization, and application.

Course Learning Outcomes
● Critically evaluate the performance of different algorithms, considering factors like computational complexity, scalability, and real-world applicability.
● Synthesize concepts from the course to design optimized solutions for complex data handling and processing tasks, demonstrating an integrated understanding of data structures and algorithms.
● Apply theoretical knowledge of data structures and algorithms to solve real-world problems, demonstrating creativity and practical problem-solving skills.

## SE 306 - Networking

Semester Units:    1
Prerequisite:        None

Thiscourse provides an introduction to essential networking concepts and tools. Through a combination of theoretical knowledge and hands-on exercises, students will gain a solid understanding of networking fundamentals, enabling them to troubleshoot network issues and design basic network configurations

Course Learning Outcomes
● Define and explain key networking concepts such as the OSI model, LAN, WAN, and Internet functionality.
● Compare and contrast TCP and UDP protocols, identifying their characteristics and appropriate usage scenarios.
● Differentiate between public and private IP addresses and articulate the need for IPv6 over IPv4.
● Employ network tools and commands like netstat and ping to analyze connectivity and diagnose network issues.
● Navigate and modify network configuration files such as /etc/hosts to manage hostname resolutions and interface properties effectively.
● Demonstrate port listening techniques using Bash scripts and netcat to debug connectivity and firewall problems.

## SE 400 - Technical Interview Preparation

Semester Units:   3
Prerequisite:       SE 201 or SE 202 or SE 305

This course focuses on applying advanced data structures and algorithms to solve intricate problems commonly encountered in technical interviews. Students will learn to break down coding problems, evaluate solution strategies based on factors like time and space complexity, and design innovative solutions. Emphasis is placed on clear communication of coding choices and thought processes, mirroring real interview scenarios. By the end of the course, students will be adept at translating theoretical knowledge into practical solutions, ready to excel in technical interviews.

Course Learning Outcomes
● Apply advanced data structures and algorithms to solve complex problems typically encountered in technical interviews, demonstrating the ability to translate theoretical knowledge into practical solutions.
● Analyze various coding problems and solution strategies, breaking them down into component parts and understanding the relationships between these parts to devise efficient algorithms.
● Evaluate different algorithms and coding solutions for a range of problems, considering factors such as time complexity, space complexity, and scalability, to determine the most effective approach.
● Design and implement novel solutions to complex problems, demonstrating creativity and innovation in the approach to coding and algorithm development.
● Communicate complex solutions and thought processes, articulating the reasoning behind code and algorithm choices clearly and convincingly, as would be required in a real technical interview scenario.

## SE 401 - Modern JavaScript for Frontend

Semester Units:   3
Prerequisite:       SE 300

This course is designed to equip students with the essential skills and knowledge required to leverage modern JavaScript features effectively in web development projects. Through a combination of theoretical learning and practical application, students will explore advanced concepts and techniques to enhance their proficiency in JavaScript and TypeScript programming.

Course Learning Outcomes
● Apply ES6 basics, including new syntax and features such as let, const, arrow functions, and template literals, through practical coding scenarios. Showcase the ability to utilize ES6 in real-world coding tasks.
● Implement ES6 Promises for asynchronous operations. Write clean and efficient promise-based code, demonstrating proficiency in managing asynchronous tasks effectively, and showcasing the ability to apply promise-based programming principles in real-world scenarios.
● Apply ES6 classes to create modular and maintainable code structures. Demonstrate comprehension of class-based code organization and abstraction, showcasing the ability to create scalable and reusable components.
● Apply ES6 features for data manipulation, including advanced array methods, destructuring, and spread/rest operators. Efficiently handle and process data in web applications. Analyze data manipulation tasks, demonstrating the ability to apply ES6 features effectively in practical scenarios.
● Apply skills in TypeScript, explaining its benefits for large-scale application development. Evaluate TypeScript's integration with JavaScript projects to enhance code reliability and maintainability, demonstrating comprehension of TypeScript's role in modern development environments.

## SE 402 - Advanced HTML & CSS

Semester Units:   2
Prerequisite:       SE 302

In this course, students will acquire and apply advanced HTML concepts, browser developer tools for debugging and optimizing HTML and CSS, and advanced CSS techniques including Grid, Flexbox, animations, and preprocessors. Students will  also learn responsive web design principles for seamless adaptation across devices.

Course Learning Outcomes
● Implement advanced HTML concepts and techniques, including semantic HTML, forms and validation, multimedia integration, and accessibility, to create rich and interactive web content.
● Utilize browser developer tools for debugging and optimizing HTML and CSS, understanding how to inspect elements, modify styles, and analyze performance in real-time.
● Apply advanced skills in CSS, including CSS Grid, Flexbox, custom properties (variables), animations, and preprocessors, to design sophisticated and dynamic web layouts.
● Implement responsive web design principles and techniques, using media queries, flexible grid layouts, and responsive images to ensure web pages adapt seamlessly across different devices and screen sizes.

## SE 403 - Frontend Framework

Semester Units:   4
Prerequisite:       SE 401

This course covers React fundamentals and advanced techniques for building interactive web applications. Students will learn JSX, components, and lifecycle methods, design reusable component architectures, and master state management with props, hooks, and Redux. Additionally, they will configure Webpack, implement styling approaches, and apply immutable data patterns for enhanced performance. By the course end, students will be proficient in building scalable React applications tailored to modern web development demands.

Course Learning Outcomes
● Explain React fundamentals, including JSX, components, and lifecycle methods.
● Apply React fundamentals, including JSX, components, and lifecycle methods to design and develop efficient, reusable component architectures.
● Apply state management in React, including the use of props for data passing and hooks for stateful logic, to create interactive and dynamic user interfaces.
● Configure Webpack for React applications and implement various styling approaches, including inline styling and CSS modules, to enhance the visual and functional aspects of web applications.
● Apply immutable data patterns in React, understanding their significance in enhancing application performance and state predictability.
● Use Redux for global state management in React applications, including action creators, reducers, and selectors, and will integrate Redux effectively using connectors and providers.

## SE 404 - Advanced Frontend Concepts

Semester Units: 2
Prerequisite: SE 402

This course covers essential web development skills, including Markdown to HTML conversion, Flexbox layout design, web form development with client-side validation, web accessibility best practices, advanced CSS styling techniques, and Sass/SCSS proficiency. By course end, students will adeptly create modern, accessible, and visually engaging web applications.

Course Learning Outcomes
- Demonstrate the ability to convert Markdown to HTML, understanding Markdown syntax and utilizing tools or libraries for parsing and rendering, highlighting the importance of content management in web development.
- Use of Flexbox for layout design, showcasing their skills in creating complex, responsive, and efficient layouts that adapt to different screen sizes and devices.
- Create and validate web forms, including handling user inputs, form styling, and implementing client-side validation to enhance user experience and data integrity.
- Apply best practices in web accessibility, ensuring that their web applications are accessible to users with various disabilities, adhering to standards such as WCAG and ARIA roles.
- Explore creative possibilities with CSS, using advanced styling techniques, animations, and transitions to create visually engaging and interactive web elements.
- Gain proficiency in using Sass/SCSS for efficient styling of web applications, leveraging features like variables, mixins, and nested rules to write more maintainable and scalable CSS.

## SE 405 - Modern JavaScript for Backend

Semester Units: 3
Prerequisite: SE 300

This course covers modern JavaScript, including ES6 features like arrow functions and promises, essential for backend development. Students learn Node.js fundamentals, unit testing, and integrate concepts into real-world projects. By course end, students are proficient in backend development using JavaScript and Node.js.

Course Learning Outcomes
- Apply modern JavaScript, including ES6 features such as arrow functions, promises, classes, and advanced data manipulation techniques, applying these concepts to backend development.
- Apply NodeJS, including its event-driven architecture and non-blocking I/O model, to develop basic applications using NodeJS.
- Write and implement unit tests in JavaScript, using testing frameworks to ensure code reliability and application functionality.
- Integrate the learned concepts into a cohesive backend project, demonstrating the ability to apply modern JavaScript, TypeScript, and NodeJS in a real-world backend development context.

## SE 406 - Advanced Backend Concepts

Semester Units:   4
Prerequisite:        SE 202

SE 406 Advanced Backend Concepts covers advanced Python backend development techniques. Students master variable annotations for code readability and type checking. They learn async programming, testing, pagination, caching, i18n, queuing systems, and file management for efficient backend operations. Through hands-on exercises, students gain practical skills for optimizing performance and scalability in backend applications

Course Learning Outcomes
● Use variable annotations in Python, applying their role in improving code readability, maintainability, and error prevention in type checking.
● Develop proficiency in asynchronous programming in Python, including the use of async/await syntax and asynchronous comprehensions, to efficiently handle concurrent tasks.
● Apply advanced testing techniques, including unit testing and integration testing, using Python's testing frameworks to ensure code reliability and application integrity.
● Implement pagination in backend systems, understanding how to manage large datasets efficiently and improve application performance and user experience.
● Apply various caching techniques and strategies, understanding how caching can significantly enhance backend performance and scalability.
● Implement internationalization (i18n) in backend applications, ensuring that their applications can support multiple languages and regional settings, enhancing global usability.
● Implement queuing systems using JavaScript, understanding the role of queues in managing asynchronous tasks and handling high-traffic operations.
● Implement efficient file management and handling in backend systems, including file storage, retrieval, and manipulation.

## SE 407 - Advanced Storage Concepts

Semester Units:   2
Prerequisite:        SE 301

In this course, students will apply MySQL for complex queries and optimization, and explore NoSQL concepts and Redis basics. Students will learn to select the right storage solutions for various applications based on data structure, scalability, and performance needs.

Course Learning Outcomes
● Develop an advanced understanding of MySQL, mastering complex queries, optimization techniques, indexing, and stored procedures to efficiently manage and manipulate large datasets.
● Explain NoSQL database concepts and implementations, understanding the key differences from traditional relational databases and the appropriate use cases for NoSQL technologies.
● Apply the basics of Redis, an in-memory data structure store, focusing on its use cases, data types, and how to integrate Redis into existing applications for enhanced performance.
● Evaluate scenarios to select appropriate storage solutions (SQL, NoSQL, or Redis) for different types of applications, considering factors like data structure, scalability, and performance requirements.

## SE 408 - Authentication & Authorization

Semester Units:   2
Prerequisite:       SE 405

In today's digital age, the security of personal data is of paramount importance. In this course, students will delve into the principles and best practices of handling personal data securely, encompassing data privacy laws, encryption techniques, and secure storage methods. Through theoretical lectures and practical exercises, students will develop a thorough understanding of safeguarding personal data against unauthorized access and breaches.

Course Learning Outcomes
● Explain the principles and best practices of handling personal data securely. They will explore data privacy laws, encryption methodologies, and secure storage techniques to ensure compliance and protection of sensitive information.
● Apply skills to implement basic authentication mechanisms, including user credentials verification and secure password handling. Through hands-on exercises, they will learn fundamental techniques to authenticate users securely and prevent unauthorized access to sensitive data.
● Implement session-based authentication, encompassing session management, cookies, and session security. By understanding the intricacies of session handling, students will ensure secure and efficient user state management in web applications.
● Design and build a comprehensive user authentication service that integrates concepts of personal data management, basic authentication, and session management into a cohesive system. Through practical projects, students will apply their knowledge to develop robust authentication solutions that safeguard user data and enhance system security.

## SE 410 - Portfolio Project

Semester Units:   5
Prerequisite:       Specialization Courses

SE 410 Portfolio Project builds upon the knowledge and skill students have developed through the program, and culminates in a final project that demonstrates career readiness and technical proficiency. Blending web application development with project management principles, students will plan, execute, and present web projects effectively. They will master tools like Trello for project organization and apply technical skills in front-end or back-end development. Proficiency in Git/GitHub for version control and collaboration will be emphasized. Through project presentations and reflection, students will learn to communicate project details and identify areas for improvement, fostering ongoing learning and skill development in software engineering.

Course Learning Outcomes
● Demonstrate career readiness by producing a final web application project, defining project scope, objectives, and timelines using project management tools (e.g., Trello, Kanban boards) to organize and track progress effectively.
● Apply technical knowledge in front-end or back-end development to build a fully functional web application. Utilize problem-solving skills to address challenges encountered during the development process.
● Exhibit proficiency in using Git and GitHub for version control, showcasing best practices in committing changes, branching, merging, and resolving conflicts. Collaborate on code with team members through pull requests and code reviews.
● Develop and deliver a comprehensive presentation that effectively communicates the project's purpose, architecture, technologies used, and key functionalities. Articulate challenges faced, solutions implemented, and lessons learned throughout the project development cycle.
● Reflect on the portfolio project experience to identify strengths, areas for improvement, and strategies for ongoing learning and development in software engineering. Plan for future enhancements to the project or new projects that build upon the skills and knowledge gained.

## SS 200 - Introduction to Sociology: Gender Equality, Women Empowerment, and Education

Semester Units:   3
Prerequisite:      WR-I

This course provides students with an overview of the field of sociology, with a special focus on the issues of gender inequality, women's empowerment, and education through a sociological lens. Using theoretical frameworks, case studies, and analysis of historical and contemporary events, students will explore the intersection of gender and society, and the pivotal role of education in reducing gender disparities.

Course Learning Outcomes
- Explain what sociology is, the primary topics that sociologists study, and the primary methods used by sociologists.
- Analyze the historical context of gender inequality and women's rights.
- Evaluate current sociological perspectives on gender and power dynamics.
- Evaluate the influence of culture, institutions, and social structures on gender roles.
- Define, explain and analyze the relationship between education and women's empowerment.
- Apply sociological knowledge to advocate for gender equality and social change.
- Evaluate gender biases and disparities in different situations by applying social theories.

## SS 300 - Consumerism in Society

Semester Units:   3
Prerequisite:      WR-I

This course explores the sociological aspects of consumerism and its profound impact on society. Students will examine the historical development of consumer culture, the social and economic forces that drive consumption, and the ways in which consumerism influences identity, social relationships, and inequality. Through critical analysis and interdisciplinary perspectives, the course will delve into the role of media and advertising, the ethical implications of consumption, and the social and environmental consequences of consumer habits. By engaging with diverse theoretical frameworks and empirical studies, students will gain a comprehensive understanding of consumerism's role in shaping contemporary social life.

Course Learning Outcomes
- Analyze the historical development of consumer culture.
- Evaluate the impact of consumerism on social identity and relationships.
- Critically examine the role of media and advertising in shaping consumer behavior
- Assess the ethical implications of consumption.
- Develop informed perspectives on alternatives to consumerism.

## SS 360 - Research Methods in Social Sciences

Semester Units:   3
Prerequisite:       SS-I or SS-II and QNT 102

This course provides an overview of research practices in the social sciences, including critical analysis of research paradigms, ethical considerations, research design, both quantitative and qualitative methodologies, and dissemination of results. Learners will acquire and exhibit skills for both evaluating and generating original research.

Course Learning Outcomes
- Argue the importance of, value of, and ethics of the research process in the social sciences.
- Compare and contrast the advantages and disadvantages of the core features of various forms of research design.
- Determine the appropriate use, strengths, weaknesses of various forms of quantitative and qualitative research methodologies.
- Interpret and relay results of both quantitative and qualitative research.
- Compose an original research design and report including a literature review, mixed methodology of one's choosing, and basic results.
- Modify a written report into an effective oral presentation with appropriate accompanying slides.
- Modify a written report into an effective poster presentation.

## WR 100 - Fundamentals of Effective Communication

Semester Units:   3
Prerequisite:       None

This course is designed to prepare students to not only use public speaking as an approach to deliver a message, but also to make a long-lasting impact and leave a powerful impression through their speech. Through study and speech assignments, students learn about concepts and models of communication, how to adapt a speech for different occasions and audiences, how to effectively support their ideas, how to apply their critical thinking skills in selecting and organizing materials in preparation for a speech, and how to utilize multimedia tools in presentations. Foundational to the process is learning how to maintain strong ethics in the preparation and delivery of impactful speeches and presentations.

Course Learning Outcomes
- Define and apply the foundational principles of written communication, its core components (the 7Cs) and explain the significance of each.
- Craft clear, concise, and well-structured written messages for a range of audiences, by identifying and applying the most appropriate framework (7Cs, 5W&1H, 3 Appeals and RACI) to your message.
- Create professional proposals and recommendation reports by applying persuasive and argumentative writing skills.
- Apply effective secondary research techniques, including the responsible use of AI tools, to gather relevant information to support arguments and add authority and legitimacy to your writing.
- Demonstrate the proficient use of proofreading and editing processes to create error-free written communication.
- Adapt written communication styles to a range of academic and professional audiences, by using appropriate messaging, tone, voice and register that resonates most with the intended audience.
- Employ critical thinking and analysis in professional and academic report-writing to ensure relevance and entirety of the purpose of the writing.
- Apply audience analysis and writing frameworks to create effective messages, posts, adverts etc. for optimal digital communication, and the development of a consistent and professional online presence.

## WR 300 - Advanced Business Communication

Semester Units:   3
Prerequisite:       WR-I

This general education course is designed to provide students with a deep understanding of the complex and dynamic nature of communication within the corporate world. Through a combination of theoretical insights, practical skills, and a focus on developing a strategic mindset, students will acquire the advanced competencies necessary to excel in professional settings.

Course Learning Outcomes
- Explain, and apply in different contexts, business communication theories and frameworks, including Aristotle's Communication Model, Shannon-Weaver Model, Berlo's S-M-C-R Model, Lasswell's Model, Transactional Model of Communication, Spiral of Silence Theory, Agenda-Setting Theory, Framing Theory, and Diffusion of Innovations Theory.
- Develop advanced written and spoken communication skills tailored for diverse professional contexts, including strategizing for organizational or team communication, preparing operational communication plans, and creating and running communication campaigns within and outside the organization.
- Apply strategic communication approaches to enhance team effectiveness and organizational success by defining clear communication channels, practicing effective communication techniques and adopt communication strategies for crisis management, integration of technology and cultural sensitivity.
- Analyze the audience, situation and purpose, and create effective communication plans, strategies, and campaigns to achieve the communication's goal.
- Exhibit proficiency in intercultural and global communication by adopting effective audience research and analysis processes, evaluating the results and defining appropriate messaging that conforms to the audience's cultural norms.
- Foster leadership and collaboration by applying advanced communication techniques, including conflict resolution, storytelling, and implementing communication models, such as RACI, GROW, KISS, Lencioni's Five Dysfunctions and the Johari Window, to develop appropriate communication strategies.
- Synthesize and apply communication strategies in new, innovative contexts, including the most effective approaches to AI for communication, research and time management.