

# UNIVERSITY OF JAMMU

(NAAC ACCREDITED 'A' GRADE UNIVERSITY)  
(Baba Sahib Ambedkar Road, Jammu-180006 (J&K))

Academic Section

Email: [academicsectionju14@gmail.com](mailto:academicsectionju14@gmail.com)

## NOTIFICATION

(24/Oct./ Adp./ 76)

It is hereby notified for the information of all concerned that the Vice-Chancellor, in anticipation of the approval of the Academic Council, is pleased to authorize the adoption of the Syllabus and Courses of Studies for **Four Year Under Graduate Programme (Design Your Degree) of Semester IIIrd (as given in the annexure)** for the examinations to be held in the years as per the details given below:

Programme	Semester	For the examinations to be held in the year
FYUGP (Design Your Degree)	Semester-III	December 2024, 2025 and 2026

The Syllabi of the courses are also available on the University website:  
[www.jammuuniversity.ac.in](http://www.jammuuniversity.ac.in).

DEAN ACADEMIC AFFAIRS

No. F. Acd/II/24/10391-97

Dated: 11/10/2024

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Copy for information and necessary action to:

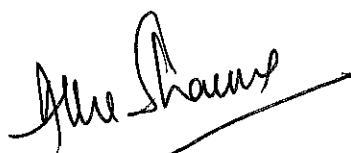
1. Director/Convener, Board of Studies in **Design your Degree**
2. Sr. P.A.to the Controller of Examinations
3. All members of the Board of Studies
4. Confidential Assistant to the Controller of Examinations
5. Director, Computer Centre, University of Jammu
6. Deputy Registrar/Asstt. Registrar (Conf. /Exams. UG )
7. Incharge University Website for necessary action please

**University of Jammu**  
**Four Year Innovative Undergraduate Program**

**(Design Your Degree)**

**Semester III**

<b>Course Code</b>	<b>Course Title</b>	<b>Credits</b>	<b>Contact Hours (per credit)</b>
UFDDPC-301	Does the world revolve around Economics	04	15
UFDDPC-302	Social Innovations	04	15
UFDDPC-303	Art and Science of Communication	04	15
UFDDPC-304	Understanding the Challenges of Climate Change	04	15
UFDDPC-305	Technologies of the Future	04	15
UFDDPC-306	Developing equipoise of mind and body	02	15
UFDDPA-307	The Art of Mathematical Modelling	04	15



**Prof. Alka Sharma**  
**Director, SIEDC**

University of Jammu  
Four Year Innovative Undergraduate Program  
(Design Your Degree)  
Semester III  
(For the session 2024, 2025, 2026)

**Course Code: UFDDPC-301**

**Credits: 04**

**Contact Hours: 15 per credit**

**Course Title: Does the world revolve around Economics**

**Maximum Marks: 100**

**Internal Evaluation: 30**

**External Evaluation: 70**

### Course Objectives

"This course explores the central question: 'Does the world revolve around economics?' by examining the pervasive influence of economic principles on global events, policies, and everyday life." It seeks to uncover the pervasive influence of economic principles and dynamics on the functioning of societies, institutions, and individuals worldwide. Grounded in interdisciplinary perspectives and empirical analysis, this course examines the multifaceted relationships between economics and various aspects of human existence, from global governance to individual decision-making. Through a combination of theoretical inquiry, case studies, and experiential learning, students will gain a deep understanding of how economic forces shape and are shaped by social, political, and cultural factors, illuminating the intricate web of interdependencies that underpin the world's economic landscape. The major focus of the course is to delve into following questions and statements:

1. Wars have profound and multifaceted impacts on economies, influencing everything from immediate financial markets to long-term development trajectories. They lead to the loss of human capital, reduced productivity, and setbacks in education and healthcare.
2. How interruption of trade due to wars can lead to shortages of goods, increase prices, and disruption of global supply chains, affecting economies worldwide?
3. What is the process of economy recovery and reconstruction?
4. **Does political power drive economic change, or does economic power drive political change?**
5. **How do economic policies affect political stability and vice versa?**
6. What is the role of incentives, information asymmetry, and socio-economic factors in decision-making of individuals.
7. How people make decisions under stress and uncertainty, providing insights into how fear, urgency, and survival instincts shape economic choices.

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**Internal Evaluation: 30**

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### **Learning Outcome**

Studying the economic impacts of wars through the lens of real time case studies students will get a comprehensive understanding of both macroeconomic and microeconomic dynamics in times of conflict. At macro level, students will grasp how wars necessitate significant resource reallocation, leading to the opportunity costs of foregone investments in other sectors such as healthcare, education, and infrastructure. Through experiential comparison, students will identify how different political and economic ideologies are applied in real-world organizational structures. At micro level, students will be able to **explore how local economies are influenced by and contribute to broader economic trends. They will be able to comprehend** the role of incentives, information asymmetry, and socio-economic factors in decision-making at individual level. Thereby gaining insight into the influence of individual and collective behavior, particularly in the context of scarcity and survival. Throughout the semester, through experiential learning, by demystifying economic principles and applying them to real-world scenarios, the students shall empower to think critically, question conventional wisdom, and uncover the hidden truths that shape our society. Thus, they may be able to apply economic reasoning to real-world scenarios.

### **Course Content**

**I. Wars and its profound and multifaceted impacts on economies, affecting everything from immediate financial markets to long-term development trajectories. Comprehensive understanding of the critical role of economic policies in both preventing conflicts and facilitating post-war recovery**

1. The Syrian Civil War and destruction of infrastructure
2. Mongol's Invasion and its impact.
3. The ongoing conflict in Ukraine and disruption of the export of grain, causing global food supply issues and price increases.
4. The economic impacts of the Vietnam War continue to influence Vietnam's economic policies and development strategies.
5. Post-war Iraq and its impact on its foreign investment
6. Post-World War II reconstruction in Europe, supported by the Marshall Plan, led to significant economic recovery and growth.



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**Activities**

1. Provide students with real-time data on global food prices before and after the Ukraine conflict. Students analyze the data to understand the economic impact on global markets and make predictions about future trends.
2. Students create an interactive digital map that visually represents the economic impacts of different wars (including those in your assignments). The map should include data points, images, and brief analyses of each conflict.
3. Students participate in a role-playing simulation where they take on the roles of different stakeholders during the Mongol Invasion (e.g., local rulers, traders, Mongol leaders). They must navigate the immediate economic devastation and plan for the future.
4. Students may work in teams to develop a comprehensive reconstruction plan for a hypothetical war-torn country. The plan should include infrastructure rebuilding, economic policy reforms, foreign investment strategies, and social stability measures.

**Books for reference**

1. The Economics of War by Paul Poast
2. War and the Economy in the Twentieth Century by Alan S. Milward
3. War and Peace: Essays on the Relationships between War and the Military Establishment by Michael Howard (Editor)
4. The Economic Consequences of the Peace by John Maynard Keynes
5. The Oxford Handbook of War by Julian Lindley-French and Yves Boyer (Editors)
6. Syria: The Making and Unmaking of a Refugee State by Dawn Chatty
7. Postwar: A History of Europe Since 1945 by Tony Judt
8. The Great War and the Origins of Modern Finance by Marc Flandreau
9. Man, the State, and War: A Theoretical Analysis by Kenneth N. Waltz
10. War and Change in World Politics by Robert Gilpin
11. Vietnam's Economic Entities in Transition edited by Akira Suehiro and Tran Van Tho.
12. Vietnam's Economic Miracle: Policy Reforms and Economic Growth" by Adam Fforde and Stefan de Vylder

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**Documentaries**

1. The Fog of War
2. For Sama
3. Restrepo
4. Trade Disruptions and War
5. Beyond Borders: The Debate Over Humanitarian Intervention (2000)
6. The War After the War (1998)
7. The Marshall Plan: Against the Odds (1997)
8. Hearts and Minds
9. The Vietnam War

**II. To Understand how political and economic factors intersect in real-world governance. Investigation of different political ideologies that shape economic policies:**

1. **Capitalism:** The market-driven approach where private ownership and profit motive dominate, and the role of the state is debated between laissez-faire and interventionist models.
2. **Socialism:** A system in which the state or community plays a significant role in controlling resources and distributing wealth.
3. **Mixed Economies:** How most modern nations implement a blend of capitalist and socialist elements.

**Activities**

1. Students shall conduct interviews with workers or managers at both locations to understand the differences in decision-making, profit distribution, and worker involvement in governance. They present their findings, comparing the capitalist and cooperative models.
2. Visit to a local government or policy-making institution (e.g., city council, central bank, or government economic advisory office) to observe how economic policies are debated and shaped by political considerations.

*Alu Shams*

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**Books**

1. "The Wealth of Nations" by Adam Smith
2. **Economic Development by Higgins**
3. **Capital in the Twenty-First Century" by Thomas Piketty**
4. **The Road to Serfdom" by Friedrich Hayek**

**Documentary**

1. **The Corporation" (2003)**
2. **"Inside Job" (2010)**
3. **Capitalism: A Love Story" (2009)**

**III. Uncovering surprising truths about:**

**The economics of human behavior, particularly regarding the role of incentives whether monetary rewards, recognition, or social approval influences the decisions making more than just financial motivations and the role played by it in shaping behaviors and choices. Uncovering the role of information in decision-making, market efficiency, and policy effectiveness.**

**Activities**

1. Write a final reflection paper on what you have learned about the hidden side of economics and how it applies to your daily life.
2. Using data analysis tools to interpret economic data; identify trends and different causal relationships.
3. In small groups, students design a policy that uses specific incentives (monetary or non-monetary) to achieve a social or economic goal (e.g., reducing carbon emissions, increasing savings rates). They must consider how different incentives will influence behavior and the potential outcomes.

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**Books**

1. **The Undercover Economist by Tim Harford**
2. **Freakonomics by Steven D. Levitt and Stephen J. Dubner (Primary Text)**
3. **Super Freakonomics by Steven D. Levitt and Stephen J. Dubner**

**Documentaries**

1. **The Economics of Happiness (2011)**
2. **Freakonomics: The Movie"**
3. **The Big Short**
4. **Inside Job**
5. **TED Talks by Steven Levitt, Dan Ariely, and Richard Thaler**

**IV. Economics extends beyond finances and markets; it delves into human behavior and societal dynamics, revealing unexpected insights about how people and society functions.**

1. **Causation and correlation between various socio-economic and cultural aspects**
2. **Complex interplay of socio-economic factors in understanding various societal issues and providing an economical solution to it.**

*Althe Shams*  
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**Activities**

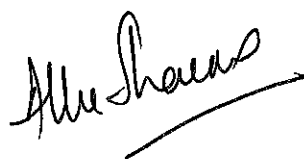
1. Students will design and conduct interviews and surveys to gather primary data on economic behaviors and social norms. This could involve looking at how people make decisions in local markets, manage household finances, or engage in informal economies.
2. Students choose a public space (e.g., a park, coffee shop, or campus) to observe and analyze social interactions through an economic lens. They can focus on how individuals negotiate, cooperate, or compete in social settings.
3. Organize a debate where students explore the intersection of economics and social justice. They can argue for or against specific policies (e.g., universal basic income, minimum wage laws) and their impact on societal dynamics and human behavior.

**Books for reference**

1. Freakonomics by Steven D. Levitt and Stephen J. Dubner (Primary Text)
2. Super Freakonomics by Steven D. Levitt and Stephen J. Dubner
3. Thinking, Fast and Slow by Daniel Kahneman
4. Predictably Irrational by Dan Ariely
5. Nudge by Richard H. Thaler and Cass R. Sunstein

**Documentaries**

1. Freakonomics: The Movie"
2. The Big Short
3. Inside Job
4. TED Talks by Steven Levitt, Dan Ariely, and Richard Thaler



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**Internal Evaluation: 30**

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**Pedagogical Approaches:**

The pedagogy of this course is entirely in align with the pedagogy prescribed for the Design Your Degree program. The course design incorporates a variety of interactive activities, practical exercises, and real-world experiences to facilitate holistic learning and skill development. The prime emphasis shall be on active participation and hands-on experiences, which are highly effective in understanding complex issues like the economic impacts of war. Accordingly small groups shall be formed to discuss case studies of different wars and their economic impacts. Each group presents their findings.

**Mode of Evaluation**

The assessment structure for this program consists of two components: internal assessment and external assessment. The internal assessment, shall account for 30 per cent of the overall grade, on the basis of continuous performance monitoring through minor projects, group discussions, presentations/tests/quizzes, class participation, team work and 70% of the grade shall be assessed through a Major Project, which will span an entire semester. The evaluation of the major project would be comprehensive, considering various factors like identification of problem, methodology applied, tools used, data analysis and practical implication of the project. The project may involve choosing a specific war/local issue and conduct a detailed analysis of its long-term economic impacts, presenting their findings in a comprehensive research paper and oral presentation.

**Internal Evaluation shall be based on**

1. Participation in Discussions and Activities
2. Weekly Assignments and Reflections
3. Minor Projects and Presentations

**External Evaluation shall be based on**

1. Major Project and Final Presentation:



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**Course Code: UFDDPC-302**  
**Credits: 04**  
**Contact Hours: 15 per credit**

**Course Title: Social Innovations**  
**Maximum Marks: 100**  
**Internal Evaluation: 30**  
**External Evaluation: 70**

### Course Objectives

According to the Center for Social Innovation at the Stanford, Graduate School of Business, social innovation is defined as “A novel solution to a social problem that is more effective, efficient, sustainable, or just than existing solutions and for which the value created accrues primarily to society as a whole rather than private individuals.” Social innovation is vital for creating sustainable, inclusive, and effective solutions to the complex challenges facing society today. It not only addresses immediate issues but also contributes to long-term systemic change, enhancing the overall well-being of individuals and communities.

This course explores the concept of social innovation, focusing on how novel solutions can address pressing social challenges. At the end of the course, students will

- Understand the community problems, social and economical change.
- Identify new and unaddressed social needs.
- Understand social innovation concepts and approaches.
- Analysis of social innovation disclosures in different sectors.
- Design innovative solutions with social impact through application of new models of leadership, collective intelligence and creativity techniques.

*Learning Outcomes?*

Students are expected to develop the following skills / competencies

- *Visionary* – Articulate the vision for self and society and believe that they can play a role in making the world a better place
- *Change Maker* – Understand the problem from someone else’s perspective and solve problems by identifying new ideas
- *Collaborator* – Cultivate and nurture networks by working in teams and show empathy while interacting with others
- *Courageous Leader* – Think critically and be willing to navigate success and failure by working persistently over time
- *Community Orientation* – Feel respect for the community and appreciate the impact of diversity in the society

### Understand the Social Context

Students (in groups of 4-5) will immerse themselves in a social context (preferably a rural setting) wherein they will be undertaking the following activities.

- Stay / Visit a village / town (other than their hown-town) for atleast one week
- Interact with various stakeholders within the community and understand the social context
- Identify various issues / challenges / problems / opportunities in the social context
- Undertake social , economic, resource and livelihood mapping of the village

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- Assess the infrastructure (education, agriculture, health, community and related) available in the area
- Identify various institutions (government / non-government / community driven) working in the area.
- Evaluate the role of various government schemes in the development of the community and the area
- Assess the cultural and historical aspect of the area

Based on this, students will identify the social problem

#### Identify the Social Problem

The team is expected to conduct a thorough research to understand the problems which exist in the community and which the team want to address. The team will engage with the community members and other stakeholders to gain insights and understand the community's needs and perspectives.

To frame the social problem effectively, students can refer to the following theories of social innovation - Structural Functionalism; Conflict Theory; Symbolic Interactionism; Social Constructionism; Systems Theory; Feminist Theory; Critical Race Theory; Rational Choice Theory; Human Capital Theory; Ecological Systems Theory; Strain Theory; Social Learning Theory; Labeling Theory

#### Case Studies on Social Innovation

Students will go through the successful social innovation case studies and understand the social impact it has created. List of indicative case studies are

- Grameen Bank [<https://grameenbank.org.bd/>]
- BRAC [<https://www.brac.net/>]
- Aravind Eye Care System [<https://aravind.org/>]
- Ashoka [<https://www.ashoka.org/>]
- SELCO India [<https://selco-india.com/>]
- Jaipur Foot [<https://www.jaipurfoot.org/>]
- Barefoot College [<https://www.barefootcollegetilonia.org/>]
- Goonj [<https://goonj.org/>]
- Teach for India [<https://www.teachforindia.org/>]

#### Innovate for Social Problem

Based on the social problem identified in Unit 1 & 2, students will work on possible innovative solution. Students will be exposed to various models of social innovation - Social Enterprises, Open Innovation, Crowd sourcing and Crowd funding, Living Labs, Microfinance, Social Franchising. The relative merits and demerits of each of these models will be discussed.

#### List of Books / Readings

- Social Innovation: How Societies Find the Power to Change by Geoff Mulgan (2019)
- The Open Book of Social Innovation, by Geoff Mulgan (2010)

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- *Frontiers in Social Innovation: The Essential Handbook for Creating, Deploying, and Sustaining Creative Solutions to Systemic Problems (2022)*
- *The Neutrality Trap: Disrupting and Connecting for Social Change* by Bernard Mayer and Jacqueline N. Font-Guzmán
- *Yes to the City: Millennials and the Fight for Affordable Housing* by Max Holleran, reviewed by Asher Kohn
- *Another World Is Possible: How to Reignite Social and Political Imagination* by Geoff Mulgan
- *The Voltage Effect: How to Make Good Ideas Great and Great Ideas Scale* by John A. List
- *The New Reason to Work: How to Build a Career That Will Change the World* by Roshan Paul & Ilaina Rabbat
- *Social Innovation: Comparative Perspectives (Routledge Studies in Social Enterprise & Social Innovation)* by Helmut Anheier, Gorgi Krlev, Georg Mildemberger.
- *Systems Thinking For Social Change: A Practical Guide to Solving Complex Problems, Avoiding Unintended Consequences, and Achieving Lasting Results* by David Peter Stroh
- *The Social Labs Revolution: A New Approach to Solving our Most Complex Challenges* by Zaid Hassan
- Crutchfield, Leslie and Heather McLeod Grant. 2008. *Forces for Good: The Six Practices of High-Impact Nonprofits*. Jossey-Bass.
- Gladwell, Malcolm. 2000. *The Tipping Point*. Little Brown: Boston.
- Goldsmith, Stephen. 2010. *The Power of Social Innovation: How Civic Entrepreneurs Ignite Community Networks for Good*. Jossey-Bass.
- Laura Michelini, 2012, *Social Innovation and New Business Models: Creating Shared Value in Low-Income Markets*, Springer.
- Carlo Petrini, *Terra Madre: Forging a New Global Network of Sustainable Food Communities*, Chelsea Green.

**Mode of Evaluation**

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*M. Sharma*

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**Course Code: UFDDPC-303**

**Credits: 04**

**Contact Hours: 15 hours per credit**

**Course Title: Art and Science of Communication**

**Maximum Marks: 100**

**Internal Evaluation:30**

**External Evaluation:70**

**Course Objectives**

- Understand the fundamental theories and principles of communication.
- Analyze the role of communication in different contexts (interpersonal, group, organizational, intercultural).
- Develop practical skills in public speaking, writing, and digital media
- Explore the impact of technology and media on communication practices

**Outcomes:**

1. Students will be able to critically evaluate the effectiveness of different communication strategies
2. Students will be able to analyze the role of communication in different contexts (interpersonal, group, organizational, intercultural)

**Communication among Living organisms and Verbal and Non Verbal Communication**

History of communication, Communication Strategies of various Live Plants and Animals, Amoeba communication, Child Communication

Elements of verbal communication: Language, Effective speaking and listening skills, Barriers to effective communication. Types of non-verbal communication:., Role of non-verbal cues in communication, Cultural variations in non-verbal communicatio

**Activity:**

- Videos on -Plants, Sparrow, Fox communication
- Book The secret life of Plants 1973 by Jagdish Bose

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- Role-playing exercise where students communicate specific messages using only non-verbal cues
- functional Speaking skills,
- Reflect on the activity and discuss the challenges and insights gained.
- Observe a public place (e.g., park, café) and write a report on the non-verbal communication observe
- **Visuals without sound and effect**
- **Dumsharts**

### **Resources**

[csumb.edu/hr/employee-development/pearls-of-wisdom/verbal-non-verbalcommunication/#:~:text=Verbal%20communication%20involves%20using%20words,use%20to%20communicate%20without%20words](https://csumb.edu/hr/employee-development/pearls-of-wisdom/verbal-non-verbalcommunication/#:~:text=Verbal%20communication%20involves%20using%20words,use%20to%20communicate%20without%20words)

<https://study.com/learn/lesson/verbal-nonverbal>

Body Language: How to Read Others' Thoughts by Their Gestures Allan Pease, John Chandler  
Nonverbal Communication: Studies and Applications Nina-Jo Moore, Mark Hickson III, Don W. Stacks

### **Interpersonal Communication & Group Communication**

Dynamics of interpersonal relationships, Self-concept and self-disclosure, Conflict resolution and negotiation, Characteristics of small group communication, Roles and responsibilities in group settings, Decision-making and problem-solving in groups

### **Activity:**

- Story telling
- using boards for expressing stories,
- making and editing videos
- Improving interpersonal communication and active listening skill

*Alie Shams*

*Robert*

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**Resources**

The Lost Art of Listening: How Learning to Listen Can Improve Relationships Michael P. Nichols

Humble Inquiry: The Gentle Art of Asking Instead of Telling Edgar H. Schein

[https://www.common sense.org/education/articles media-literacy-resources-for-classroom](https://www.common sense.org/education/articles/media-literacy-resources-for-classroom)

Media and Technology in Communication, its differences and importance, Evolution of communication technologies, Impact of social media and digital platforms, Ethical issues in digital communication, Basics of visual design and graphic communication, Role of visuals in enhancing messages, Analyzing visual media and advertisements

**Activity:**

- Integrate social media,
- **Make a commercial:** Making a video of a commercial,
- **Writing Skills**

Integrating technology to enhance learning

- **Learning Management Systems (LMS):** Use platforms like Blackboard, Moodle, or Canvas for resources and assignments.
- **Online Discussion Forums:** Promote online discussions to extend learning outside the classroom.
- **Video Conferencing Tools:** Utilize tools like Zoom or Microsoft Teams for virtual presentations and guest lectures.

**Resources:**

<https://www.goguardian.com/blog/9-unique-ways-to-use-technology-in-the-classroom>

<https://asiasociety.org/education/five-ways-use-technology-and-digital-media-global-learning>

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**External Evaluation:70**

**Public Speaking and Case Studies and Applications**

Origin of public speaking, Preparing and organizing speeches, Techniques for effective delivery, Handling public speaking anxiety, Case studies on successful and failed communication strategies, Application of communication theories to real-world, Group presentations on case study analyses

**Style of Communication: Lincoln, Martin Luther, Speech Civil rights Movements**  
**Was Gandhi a good communicator**

**Activity:** Discussion and Public Speaking by using the following aspects

- **Diverse Content:** Include examples and case studies from different cultures.
- **Inclusive Language:** Use language that respects all students' identities and backgrounds.
- **Global Perspective:** Discuss communication in a global context, highlighting intercultural differences and similarities

**Resources:**

Adler, R. B., Rodman, G., & DuPré, A. (2016). Understanding Human Communication. Oxford University Press

DeVito, J. A. (2015). The Interpersonal Communication Book. Pearson.

McQuail, D. (2010). McQuail's Mass Communication Theory. Sage Publications.

academic articles, case studies, and multimedia resources provided throughout the course.

<https://courses.lumenlearning.com/publicspeakingprinciples/chapter/course-contents-at-a-glance/>

*Almeida*

*Palmer*

**University of Jammu**  
**Four Year Innovative Undergraduate Program**  
**(Design Your Degree)**  
**Semester III**  
**(For the Session 2024, 2025, 2026)**

**Course Code: UFDDPC-303**

**Credits: 04**

**Contact Hours: 15 hours per credit**

**Course Title: Art and Science of Communication**

**Maximum Marks: 100**

**Internal Evaluation:30**

**External Evaluation:70**

**Pedagogy:** The entire course is a project work based which will be on the basis of the role play to practice real-life communication, one act plays, making interactive videos, taking interview, discussion on some topics of social relevance

Mentor will facilitate class discussions to encourage critical thinking and exchange their ideas and by conducting interactive workshops on specific skills like public speaking or active listening. Mentor will use videos, podcasts, and other media to illustrate communication principles on how to understand the difference in communication and effective communication, listening and effective listening. Mentor will work on how to frame the content and justify what they want to communicate. Mentor will provoke students to think of making their communication so impressive and valid that their point doesn't remain unnoticed

Different groups of students will be allotted different projects and to be carried out that will require different task during their field visits by explorations from their surrounding

*Alleshaw*

*Ballar*

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**Course Code: UFDDPC-303**

**Credits: 04**

**Contact Hours: 15 hours per credit**

**Course Title: Art and Science of Communication**

**Maximum Marks: 100**

**Internal Evaluation:30**

**External Evaluation:70**

**Mode of Evaluation:**

The assessment structure for this program consists of two components: Internal assessment and external assessment. The internal assessment, shall account for 30% of the overall grade, on the basis of continuous performance monitoring through tests/ quizzes/ presentations/ class participation/ small live projects emphasizing on development of skills in application, effective communication and teamwork.

The remaining 70% of the grade shall be accessed through a transdisciplinary major project, which will span an entire semester.

The evaluation of the major project would be comprehensive, considering various factors including the depth and accuracy of the project's content, the applied methodology, research rigor. The candidates will be evaluated on the basis of the change in their own communication skills, overcoming inhibitions and the assessment will be based on

- **Simulations and Case Studies:** Analyze real-world communication
- **Communication Labs:** Create a lab environment for practicing speeches and presentations
- **Community Engagement:** Encourage students to engage in community projects to practice communication in diverse settings.

Assessment will be further strengthening by offering strong feedback mechanism like:

- **Peer Reviews:** Facilitate peer reviews to allow students to critique and learn from each other.
- **Self-Assessment:** Encourage self-reflection and self-assessment of communication skills.
- **Instructor Feedback:** Provide detailed feedback on assignments and participation.





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**Semester III**  
**(For the session 2024, 2025, 2026)**

**Course code:** UFDDPC-304

**Credit:** 04

**Contact hours:** 15 per credit

**Course Title:** Understanding the challenges of climate change

**Maximum marks:** 100

**Internal Evaluation:** 30

**External Evaluation:** 70

**Course Objective:** Understanding the challenges of climate change is essential for addressing its impacts and implementing effective solutions. The objective of the course is deepening students' grasp of the scientific principles behind climate change, including the greenhouse effect, the carbon cycle, and the role of human activities involving history of climate science, current climate trends, and the effects of climate change on both natural and human systems. Students will also learn about policies and governance structures designed to combat climate change. Moreover, equipping students with the ability to interpret and analyze climate data, critically, evaluate information sources, and apply scientific knowledge to propose and assess potential solutions. The course will also enhance communication skills, enabling students to effectively convey climate change issues, and foster collaborative skills through team-based projects and research. Applying theoretical knowledge to real-world scenarios through case studies, simulations, and practical projects is the foremost objective. Students will also engage with local communities and stakeholders to develop practical, effective solutions to climate challenges. By the end of the course, students will have a robust understanding of the complexities of climate change, be equipped with the necessary skills to tackle these challenges, and be motivated to engage in proactive and informed climate action.

### **Learning Outcomes**

The course will enhance the student's ability to:

- understand and analyze impact of climate change on socio-economic growth;
- decipher the link between climate change and human civilization;
- understand role and application of data science in climate change;
- understand the causal mechanisms of the factors affecting climate variability;
- understand the role of climate variability in societal transformation;
- application of interdisciplinary approach to tackle climate issues.
- understand the relation between natural hazard and climate change.

The tangible learning outcomes will be observed when

- students will demonstrate their ability to explain key concepts such as the greenhouse effect, carbon cycle, and human impact on climate change through routine discussions and quizzes.
- students will produce in-depth case studies assessing the environmental and socio-economic impacts of climate change.
- students will complete projects involving the interpretation and analysis of climate data using statistical tools.
- students will participate in and complete group projects, demonstrating their ability to work collaboratively.

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**Course Title:** Understanding the challenges of climate change

**Maximum marks:** 100

**Internal Evaluation:** 30

**External Evaluation:** 70

- students will write self-assessment reports reflecting on their learning progress and contributions to climate action throughout the course.

**Topics for Discussion**

- Climate change is real or a hoax?
  - In-depth understanding of climate change, historical perspective evidences.
  - Students will explore the causes, impacts, and potential solutions related to climate change at local and global level.
  - Through a comprehensive examination of scientific research, data, and expert opinions, participants will gain the knowledge and critical thinking skills necessary to navigate discussions surrounding climate change and distinguish facts from misinformation.
- International climate agreements – understanding role of global communities
  - Why are climate agreements so controversial?
    - Global opinion about climate change
  - How does the politics govern climate and climate govern world politics?
    - Deeper understanding of international climate agreements, and the role of world politics in governing these agreements.
  - What would be the role of Indian subcontinent, in next decade to tackle the issue of climate change?
- Climate Change and Social-Media
  - Exploring the intersection of climate change and social media, examining the influence of social media platforms on climate change discourse, communication, and activism.
  - Role of movies/entertainment/short films/dedicated TV channels in understanding the issue of climate change.
- Scientific approach and understanding the climate change
  - Scientific tools and procedures to understand the climate change.
  - Role of data science in climate change research and mitigation.
  - Understanding the impact of climate change on agriculture, water resources, ecosystems, human behavior, global economy, and socio-political component.
  - Natural disasters and climate changes. Is there any relation between these two? How can we mitigate the impact of natural disaster?
- Climate Change and Sustainable Development in the Jammu Region
  - Understanding impact of climate change on socio-economic cultural aspect of local communities in Jammu.
  - Explore mitigation strategies and sustainable development practices relevant to the region.
  - Developing skills for planning and implementing sustainable solutions in region.

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**Maximum marks:** 100

**Internal Evaluation:** 30

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**Activities:**

- Analysis of video shows on climate change and its impact
- Weekly group and biweekly individual seminar
- Quiz on field-based studies.
- Visit local ecosystems, interview experts, or participate in community initiatives focused on climate resilience and adaptation.
- Encourage students to find the real problem in the local areas and develop innovative solutions.
- Conduct research and study scientific literature, reports, and studies related to climate change
- Analyse case studies and real-world examples of the impacts of climate change and climate variability on various social and economic sectors.
- Engage in fieldwork and observations to gain firsthand experience of climate impacts and variability.
- Calculation of carbon footprint and ecological footprint.
- Temporal comparison of local flora.
- Effect of CO<sub>2</sub> on temperature experiments (Global Warming Simulation).
- Energy Consumption Experiment with Bulbs.
- Heat Island Effect Demonstration.
- Collection local climatic data of last 2-3 decades and its analysis.

**Resources:**

1. *Digital resources:*

- Down to Earth: <https://www.youtube.com/@D2E>
- United Nations (Climate Action): <https://www.un.org/en/climatechange/what-is-climate-change>
- NASA (Global Climate Change): <https://climate.nasa.gov/>
- Copernicus climate change program: <https://bookdown.org/lorianfericx/bookdown-demo/>
- Environment and Climate Change Canada: <https://www.youtube.com/@environmentcan>
- Green Ninja Academy: <https://www.youtube.com/@GreenNinjaAcademy>
- Introduction to Atmospheric Dynamics: <https://www.youtube.com/@introductiontoatmosphericd284>
- World Climate Research Program: <https://www.youtube.com/@WCRP1980>

2. *Books*

- Climate change in practices - topics for discussion with group exercise (by Robert L. Wilby)

*Muhammad*

*Asst. Prof.*

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**Credit:** 04

**Contact hours:** 15 per credit

**Course Title:** Understanding the challenges of climate change

**Maximum marks:** 100



**Internal Evaluation:** 30

**External Evaluation:** 70

- Climate change past, present and future (Marie-Antoinette Mélières, ChloéMaréchal)
- Assessment of Climate Change over the Indian Region -A Report of the Ministry of Earth Sciences (MoES), Government of India (edited by R. Krishnan · J. Sanjay ·Chellappan Gnanaseelan · Milind Mujumdar ·Ashwini Kulkarni · Supriyo Chakraborty)
- Climate Change Science: A Modern Synthesis Volume 1 - The Physical Climate (by G. Thomas Farmer, John Cook)
- Goosse H., P.Y. Barriat, W. Lefebvre, M.F. Loutre, and V. Zunz (2010). Introduction to climate dynamics and climate modeling. Online textbook available at
- <http://www.climansu.by/textbook>.
- Big Data Mining for Climate Change (by Zhihua Zhang, Jianping Li)

**Mode of Evaluation**

The assessment structure for this program consists of two components: internal assessment and external assessment. The internal assessment, shall account for 30 per cent of the overall grade, on the basis of continuous performance monitoring through minor projects, group discussions, presentations/tests/quizzes, class participation, team work and 70% of the grade shall be assessed through a Major Project, which will span an entire semester. The evaluation of the major project would be comprehensive, considering various factors like identification of problem, methodology applied, tools used, data analysis and practical implication of the project. The project may involve choosing a specific war/local issue and conduct a detailed analysis of its long-term economic impacts, presenting their findings in a comprehensive research paper and oral presentation.

  
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**University of Jammu**  
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**Semester III**  
**(For the session 2024, 2025, 2026)**

**Course Code: UFDDPC-305**  
**Credits: 04**  
**Contact Hours: 15 per credit**

**Course Title: Technologies of the future**  
**Maximum Marks: 100**  
**Internal Evaluation: 30**  
**External Evaluation: 70**

This course aims to:

1. Explore emerging technologies and their potential impact on various industries and society.
2. Understand the principles and applications of key future technologies.
3. Analyse the ethical, social, and economic implications of adopting these technologies.
4. Encourage critical thinking and creativity in envisioning the future of technology.

**Learning Outcomes:**

By the end of this course, students should be able to:

- A. Exhibit a deep understanding of the impact of emerging technologies.
- B. Apply principles of key technologies in various scenarios.
- C. Critically assess the ethical, social, and economic aspects of these technologies.
- D. Demonstrate innovative and creative thinking regarding the future of technology.

**Course Content:**

**Story of Emerging Technologies:** Students will be exposed to the different technological environments in order to make them understand and identify the different aspects and parameters that comes under the ambit of a technology.

- Internet of Things (IoT)

In a bustling metropolis, imagine homes that think, cars that communicate, and healthcare systems that predict and prevent illnesses. This is the world of IoT. From smart refrigerators that order groceries to wearable devices that monitor health, IoT transforms our daily lives. However, with great connectivity comes great responsibility. We delve into the security challenges and ethical considerations that accompany this technological revolution.

Activities:

1. Create a presentation on IoT applications and their societal impacts.

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2. Conduct group research on specific IoT use cases across different industries.
3. Engage in a group discussion focusing on the security and ethical issues related to IoT.

- **Drones**

Picture a farmer surveying his vast fields with the help of a drone, a rescue team locating survivors in a disaster zone, and a city planner mapping out urban growth from the sky. Drones are the eyes in the sky that offer unprecedented perspectives and capabilities. We explore their integration with IoT and grapple with the regulatory and ethical questions they raise.

Activities:

1. Present on drone applications using real-world examples.
2. Research in groups on the impact of drones in various industries.
3. Discuss in groups the regulatory and ethical issues in drone usage.
4. Experience a hands-on drone demonstration, if feasible.

- **The Art of Cryptography and Blockchain Technology**

Students will be exposed to the mathematics behind the Art of Cryptography to make them fiddle with the algorithms responsible for maintaining the secrecy in transmission of Data on Networks i.e WhatsApp, Facebook, Twitter, Email, Financial Transactions etc

Imagine a world where financial transactions are transparent and secure, supply chains are tamper-proof, and personal data is decentralized and controlled by individuals. This is the promise of blockchain technology. We explore the fundamentals of blockchain, its role in powering cryptocurrencies like Bitcoin and Ethereum, and its potential applications in various sectors.

Activities:

1. Participate in a workshop on blockchain fundamentals.
2. Conduct group research on blockchain applications in specific industries.
3. Engage in group discussions on the future and potential of blockchain technology.

- **Augmented Reality (AR) and Virtual Reality (VR)**

Step into a classroom where history comes alive, a training session where surgeons practice complex procedures in a virtual environment, or a game that immerses you in an alternate reality. AR and VR are transforming the way we learn, train, and entertain ourselves. We explore the concepts, applications, and challenges of these technologies.

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**Credits: 04**  
**Contact Hours: 15 per credit**

**Course Title: Technologies of the future**  
**Maximum Marks: 100**  
**Internal Evaluation: 30**  
**External Evaluation: 70**

**Activities:**

1. Attend a workshop on AR and VR concepts.
2. Research in groups on AR and VR applications in specific fields.
3. Discuss in groups the potential and future of AR and VR technologies.

**Mode of Evaluation:**

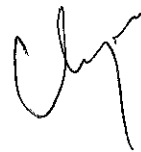
The assessment structure for this program consists of two components: internal assessment and external assessment.

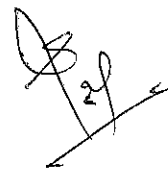
- Internal Assessment (30%): Continuous performance monitoring through tests, quizzes, presentations, class participation, and small live projects, emphasizing the development of skills in application, effective communication, and teamwork.
- External Assessment (70%): A transdisciplinary major project spanning an entire semester.

The evaluation of the major project will consider:

- The depth and accuracy of the project's content.
- The applied methodology and research rigor.
- The effective use of IT tools and data analysis.
- The meaningful findings and practical implications derived from the project.
- Testing of innovativeness, communication, and problem-solving skills.









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**Semester III**  
**(For the session 2024, 2025, 2026)**

**Course Code: UFDDPC-306**

**Credits:2**

**Contact Hours: 15 per credit**

**Course Title: Developing  
Equipoise of mind and body  
Maximum Marks:50  
Internal Evaluation:15  
External Evaluation:35**

**Course Objectives**

The course "Equipoise of Mind and Body" is designed to provide students with a comprehensive understanding of how to achieve and maintain a balanced state of mental and physical well-being. Grounded in interdisciplinary perspectives and leveraging experiential learning methods, this course aims to integrate mindfulness, emotional intelligence, physical health, and holistic practices into students' daily lives. By engaging in a variety of activities, students will cultivate self-awareness, resilience, and holistic well-being, ultimately fostering personal growth and improving their overall quality of life.

- Understand the principles of mental and physical balance.
- Develop mindfulness and meditation practices.
- Enhance physical health through regular exercise and wellness activities.
- Integrate holistic well-being practices into daily routines.
- Apply experiential learning techniques to foster personal growth and resilience.

**Learning outcome**

The course aims to provide students with a holistic understanding and practical tools to achieve and maintain a balanced state of mental and physical well-being. By the end of the course, students will have developed a comprehensive skill set that includes mindfulness practices, personalized fitness routines, healthy eating habits, and emotional intelligence. They will also have explored various holistic health practices and learned effective stress management techniques. Students will be equipped to create and sustain balanced lifestyles through well-being plans and community engagement, fostering personal growth and resilience. Continuous self-reflection and the ability to set and achieve long-term well-being goals will be integral parts of their learning journey. Overall, the course prepares students to thrive in both personal and professional domains by promoting lifelong habits of physical health, mental clarity, and emotional resilience.

Upon successful completion of this course, students will:

- Understand the Interconnectedness of Mind and Body
- Improve Emotional Intelligence and Manage Stress Effectively
- Cultivate habits of self-reflection and continuous personal growth

*Muhammad*

*Salim*

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**Course Title: Developing  
Equipoise of mind and body  
Maximum Marks:50  
Internal Evaluation:15  
External Evaluation:35**

**Understanding mind and body:** understanding how mind and body interact to promote overall well-being. Initial activities include ice-breakers and reflective journaling, encouraging students to assess their current state of mental and physical health. Various meditation techniques, such as focused attention, open monitoring, and loving-kindness, are explored.

**Activities:**

Students will identify a community need related to well-being (e.g., organizing a local wellness fair, starting a community garden, or leading a mindfulness workshop). They will develop and implement a project plan, engage community members, and reflect on the impact of their project on both themselves and the community. Journals will be evaluated based on consistency, depth of reflection, and personal insights and execution

**Resources:**

"The Miracle of Mindfulness" by Thich Nhat Hanh A practical guide to mindfulness, offering exercises and insights for integrating mindfulness into daily life.

"Wherever You Go, There You Are" by Jon Kabat-Zinn. A comprehensive introduction to mindfulness meditation from the founder of the Mindfulness-Based Stress Reduction program

**Documentaries**

"The Mindfulness Movement" (2020) Explores the growing interest in mindfulness and its impact on individuals and society

"Walk with Me" (2017), Follows Thich Nhat Hanh and his community of Zen Buddhist monks and nuns, offering insights into mindfulness practice

"Brené Brown: The Call to Courage" (2019) A documentary featuring Brené Brown, discussing vulnerability, courage, and emotional intelligence.

"Heal" (2017) Investigates the connection between the mind and body in healing, featuring insights from leading scientists and spiritual teachers

"Yogi: The Life and Times of Yogi Berra" (20

*Mr. Sharma*

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**External Evaluation:35**

**Physical Health and Exercise:** Understanding the critical role of physical activity in maintaining mental and physical health. **Nutrition and Wellness:** Emphasizes on the impact of nutrition on mental and physical health. Exploring the principles of balanced diets, healthy eating habits, hydration, and the importance of sleep.

**Activities:**

Students will design a weekly meal plan that includes balanced nutrition. They will prepare at least three meals from their plan, document the process, and reflect on the experience, noting any changes in energy levels, mood, and physical health. Meal plans, preparation documentation, and reflections will be evaluated based on nutritional balance

**Resources:**

"You Are Your Own Gym: The Bible of Bodyweight Exercises" by Mark Lauren and Joshua Clark

A practical guide to fitness, offering bodyweight exercises that can be done anywhere

"In Defense of Food: An Eater's Manifesto" by Michael Pollan An exploration of food, nutrition, and healthy eating habits, offering practical advice on how to eat well

"The Blue Zones Solution: Eating and Living Like the World's Healthiest People" by Dan Buettner

Insights from regions with high longevity rates, focusing on diet, lifestyle, and wellness practices

"The Heart of Yoga: Developing a Personal Practice" by T.K.V. Desikachar A comprehensive guide to yoga, offering practical advice and philosophical insights.

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Equipoise of mind and body  
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Internal Evaluation:15  
External Evaluation:35**

**Documentaries**

Physical Health and Wellness: "The Game Changers" (2018) Examines the benefits of plant-based diets for athletes and overall health

"Forks Over Knives" (2011) Advocates for a plant-based diet, exploring its benefits for health and longevity.

"What the Health" (2017) Investigates the impact of diet on health, exploring the benefits of plant-based eating.

**Emotional Intelligence and Resilience:** Techniques for enhancing emotional intelligence and building resilience are examined through role-playing, emotional intelligence assessments, and group activities.: The impact of stress on the mind and body, and explore techniques for managing and reducing stress.

**Activities:** Students will design a game to build resilience, healthy ways to cope and how to draw resources in their community to build resilience like learning ways to deal with stress effectively.

Students will be asked to develop social connections that might help protect health and lengthen life as our links to others can have powerful effects on our health both emotionally and physically

*Alu Sharma*

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**Maximum Marks: 50**

**Internal Evaluation: 15**

**External Evaluation: 35**

**Resources:**

Emotional Intelligence: Why It Can Matter More Than IQ" by Daniel Goleman

An exploration of the components of emotional intelligence and its importance in personal and professional settings.

"The Gifts of Imperfection" by Brené Brown A guide to embracing vulnerability and cultivating self-compassion, resilience, and emotional intelligence.

"Spark: The Revolutionary New Science of Exercise and the Brain" by John J. Ratey

Examines the connection between physical exercise and mental well-being, emphasizing the cognitive benefits of regular exercise.

**Documentaries**

"Minimalism: A Documentary About the Important Things" (2015) Explores the benefits of simplifying life and focusing on what truly matters for well-being

Holistic Well-being Practices: While focused on the life of a famous baseball player, it also touches on how physical activity and discipline contribute to mental and emotional well-being.

"Happy" (2011) Explores the science of happiness and well-being, highlighting different cultures and personal stories.

"Breath: The New Science of a Lost Art" by James Nestor, Explores the science and history of breathing techniques and their impact on health and well-being.

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**Course Code: UFDDPC-306**

**Credits: 02**

**Contact Hours: 15 per credit**

**Course Title: Developing  
Equipoise of mind and body**

**Maximum Marks:50**

**Internal Evaluation:15**

**External Evaluation:35**

**Pedagogical Approaches:**

The pedagogy of the "Equipoise of Mind and Body" course is rooted in experiential learning, a dynamic approach that emphasizes active engagement, reflection, and application of knowledge. The course design incorporates a variety of interactive activities, practical exercises, and real-world experiences to facilitate holistic learning and skill development.

Workshops on meditation, mindfulness walk, fitness, and stress management shall provide practical skills and techniques that students can apply in their daily lives. Guided meditation sessions, physical fitness classes, and group activities shall offer immersive experiences that deepen understanding and foster personal growth. Workshops on meal planning and cooking classes will provide practical skills for maintaining a nutritious diet. Additionally, sessions on sleep hygiene and lifestyle choices will highlight the interconnectedness of various wellness factors.

**Mode of Evaluation:**

The assessment structure for this program consists of two components: internal assessment and external assessment. The internal assessment, shall account for 20% of the overall grade, on the basis of continuous performance monitoring through tests/ quizzes/ presentations/ class participation/ small live projects emphasizing on development of skills in application, effective communication, and teamwork. The remaining 30% of the grade shall be accessed through a transdisciplinary major project, which will span an entire semester.

The evaluation of the major project would be comprehensive, considering various factors including the depth and accuracy of the project's content, the applied methodology, research rigor as well as the meaningful findings and practical implications derived from the project. The assessment shall also include testing innovativeness and communication.

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Sharma*



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**Semester III**  
**(For the session 2024, 2025, 2026)**

**Course code:** UFDDPA-307

**Credit:** 04

**Contact hours:** 15 per credit

**Course Title:** The Art of Mathematical Modelling

**Maximum marks:** 100

**Internal Evaluation:** 30

**External Evaluation:** 70

**Objectives:** The objectives of the course on “The Art of Mathematical Modelling” include:

- translate real-world problems into mathematical terms and structures;
- develop mathematical models that represent the essential aspects of the problem;
- use mathematical techniques, in particular, difference method and ordinary differential equations, to analyze and study the models;
- solving the corresponding ordinary differential equations using numerical techniques;
- validation of the model.

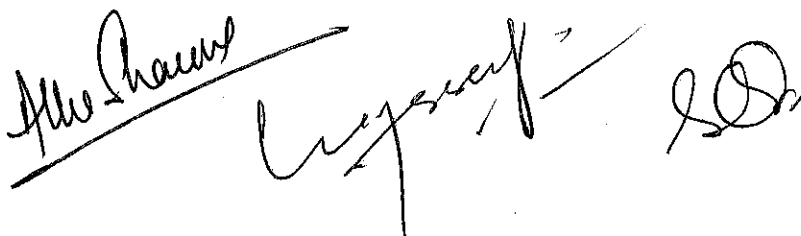
**Prerequisite of the course-** Course Number: UFDDPA-207

- **Motivation:** The real world is nature’s embodiment and change is the law of nature. Thus, the rate of change comes into play. All physical phenomena involve the rate of change which in mathematical terms is called the derivative of a function representing that phenomenon. Therefore, to find solutions to real-world problems, we need to have a mathematical formulation of that problem generally known as Mathematical modelling. After converting the phenomenon into a mathematical setting, one can use mathematical tools and techniques to analyze and solve the problem. The solution is then reformulated back to the original term in which the problem exists in the real world.
- To find the solutions to real-world problems, the students are required to have some knowledge of calculus. In fact, the knowledge of ordinary differential equations is indispensable for handling such problems.
- How a physical phenomenon is governed by a differential equation.

(1) Introduction

**Detailed Content:** One can take any physical phenomenon, for example, population growth.

- (a) Consider a discrete-time model of population growth through population data and solve the population growth problem using difference equations.



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**Credit:** 04

**Contact hours:** 15 per credit

**Course Title:** The Art of Mathematical Modelling

**Maximum marks:** 100

**Internal Evaluation:** 30

**External Evaluation:** 70

- (b) Represent the population size as a function of time and the rate of change of population, that is, the derivative of the function at a given point of time. Then explain how the given population growth phenomenon is converted into a differential equation.
- (c) **Activities:** Simple real-life problems and their mathematical formulations.
- (2) Introduction to Difference Equations  
**Detailed Content:**
- (a) Explain recursion and iteration for first and second-order difference equations.
- (b) Explain Generating functions and systems of difference equations, Logistic Equation.
- (c) **Activities:** Exercises on first and second-order difference equations.
- (d) **Assignments:** Problem sets on real-life applications of difference equations, for example, a model of a population of rabbits, a case of a single cold pill, and a model of the economy.
- (3) First-Order Differential Equations - Basics  
Solving linear first-order ODEs, separable equations, integrating factor method.  
**Detailed Content:**
- (a) Explain the methods to solve linear first-order differential equations.
- (b) Explain separable equations and how to solve them.
- (c) Introduce the integrating factor method.
- (d) **Activities:** Exercises on solving basic first-order differential equations.
- (e) **Assignments:** Problem sets on first-order differential equations and solution of the problem "Spread of a Rumor: Discrete Logistic Growth".
- (4) First-Order Differential Equations - Applications  
Growth and decay models, cooling problems, mixing problems.  
**Detailed Content:**
- (a) Exponential Growth: The Math behind "going viral".
- (b) Explain the formulation and solution of the growth model.
- (c) Explain the formulation and solution of the decay model.
- (d) Cover cooling problems and mixing problems in practical contexts.
- (e) **Activities:** Practical problem-solving sessions.
- (f) **Assignments:** Homework on applying first-order ODEs to real-life problems.
- (5) Numerical Techniques to solve first-order differential equations  
**Detailed Content:**
- (a) Introduce numerical methods for solving ODEs.

*Althe Shams* *De Jerny* *SD*

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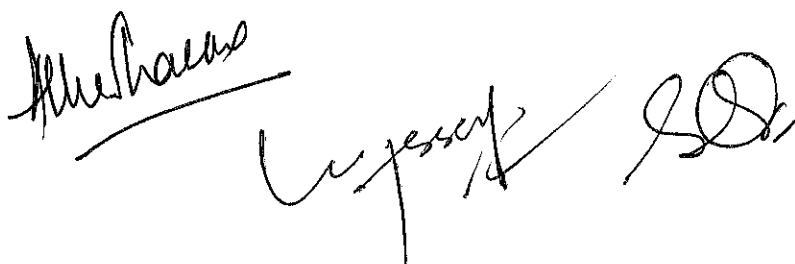
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- (b) Introduce Euler's method and its application.
  - (c) Discuss improved Euler's method and Runge-Kutta methods.
  - (d) **Activities:** Computational labs using MATLAB.
    - (a) Plotting of first-order solution of differential equation;
    - (b) Growth model (Exponential case only);
    - (c) Decay model (Exponential case only);
    - (d) Lake pollution model (with constant/seasonal flow and pollution concentration);
    - (e) Limited growth of population (with harvesting);
    - (f) Limited growth of population (without harvesting);
  - (e) **Assignments:** Numerical exercises on solving ODEs.
- (6) Modelling with difference and differential equations  
**Detailed Content:**
- (a) Discuss the process of formulating real-life problems using difference and differential equations.
  - (b) Explain to students how to solve these equations and interpret the results.
  - (c) **Activities:** Practical applications and problem-solving sessions.
  - (d) **Assignments:** Problems set on real-life applications.
- (7) Model Validation and Verification  
Methods of validating models, sensitivity analysis, and ensuring accuracy and reliability.  
**Detailed Content:**
- (a) Explain methods for validating mathematical models.
  - (b) Discuss sensitivity analysis and its importance.
  - (c) Explain how to ensure the accuracy and reliability of models.
  - (d) **Activities:** Validation exercises on previously learned models.
  - (e) **Assignments:** Homework on model validation and verification.
- (8) Case Studies in Biology.  
Modelling population dynamics, and logistic growth.



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**Pedagogy:** Mentor must introduce each topic with the help of real-life situations/problems so as to give complete understanding of the concept and enabling the students to find solutions to the problems at their own by "How to Solve it" approach. Mathematical concepts must come to the students in a natural way instead of imposing on them.

**Reference Books for self-study:**

- (1) Ross S.L. Differential Equations, 3rd edition. India: John Wiley and Sons, 2004.
- (2) Rai B., Choudhury D.P. and Freedman H.I. A Course in Ordinary Differential Equations. Alpha Science International Ltd. 2012.
- (3) Coddington E.A. An Introduction to Ordinary Differential Equation. New York: Dover Publications, 1989.
- (4) Barnes, Belinda and Glenn R. Fulford. Mathematical Modeling with Case Studies: A Differential Equation Approach using Maple and MATLAB, 2nd Ed. London and New York: Taylor and Francis group, 2009.
- (5) Hilbert, S., Maceli, J., Robinson, E., Schwartz, D., and Seltzer, S. Calculus: An Active Approach with Projects. Mathematical Association of America, 2010.

**Mode of Evaluation**

The assessment structure for this program consists of two components: internal assessment and external assessment. The internal assessment, shall account for 30 per cent of the overall grade, on the basis of continuous performance monitoring through minor projects, group discussions, presentations/tests/quizzes, class participation, team work and 70% of the grade shall be assessed through a Major Project, which will span an entire semester. The evaluation of the major project would be comprehensive, considering various factors like identification of problem, methodology applied, tools used, data analysis and practical implication of the project. The project may involve choosing a specific war/local issue and conduct a detailed analysis of its long-term economic impacts, presenting their findings in a comprehensive research paper and oral presentation.

