



**IISER**  
B E R H A M P U R

# **BS-MS SYLLABUS**

## **Humanities & Social Sciences**

## I Semester

Course No.	Course Name	LecHr	Lab Hr	Tut Hr	SS Hr	Credit
<u>BIO 101</u>	Introduction to Biological Sciences	3	0	1	6	3
<u>BIO 103</u>	General Biology Laboratory I	0	3	0	0	1
<u>CHM 101</u>	General Chemistry	3	0	1	6	3
<u>CHM 103</u>	General Chemistry Laboratory	0	3	0	0	1
<u>CDS 101</u>	Introduction to Computers	2	1	0	6	3
<u>HSS 103</u>	Basics of Communication Skills	1	0	0	2	1
<u>MTH 101</u>	Introduction to Mathematics	3	0	1	6	3
<u>PHY 101</u>	Mechanics	3	0	1	6	3
<u>PHY 103</u>	Mathematical Methods	1	0	1	0	1
<u>EES 101</u>	Introduction to Earth System Sciences	3	0	1	6	3
<b>Total</b>		<b>19</b>	<b>07</b>	<b>06</b>	<b>38</b>	<b>22</b>

## II Semester

Course No.	Course Name	LecHr	Lab Hr	Tut Hr	SS Hr	Credit
<u>BIO 102</u>	Biochemical and Cellular basis of life	3	0	1	6	3
<u>BIO 104</u>	General Biology Laboratory II	0	3	0	0	1
<u>CHM 102</u>	Basic Inorganic Chemistry	3	0	1	6	3
<u>CHM 104</u>	Inorganic Chemistry Laboratory I	0	3	0	0	1
<u>HSS 104</u>	Oral and Written Communication	1	0	0	2	1
<u>EES 102</u>	Introduction to Environmental Sciences	3	0	1	6	3
<u>MTH 102</u>	Calculus of One Variable	3	0	1	6	3
<u>PHY 102</u>	Electromagnetism	3	0	1	6	3
<u>PHY 104</u>	General Physics Laboratory I	0	3	0	0	1
<b>Total</b>		<b>16</b>	<b>09</b>	<b>05</b>	<b>32</b>	<b>19</b>

### III Semester

Course No.	Course Name	LecHr	Lab Hr	Tut Hr	SS Hr	Credit
<a href="#">BIO 201</a>	Introduction to Genetics and Evolution	3	0	1	6	3
<a href="#">BIO 203</a>	General Biology Laboratory III	0	3	0	0	1
<a href="#">CHM 211</a>	Basic Organic Chemistry	3	0	1	6	3
<a href="#">CHM 213</a>	Organic Chemistry Laboratory I	0	3	0	0	1
<a href="#">EES 201</a>	Foundation of Earth Sciences: Part 1 (Introduction to Mineralogy, Petrology)	3	0	1	6	3
<a href="#">HSS 209</a>	Technical Writing	2	0	0	4	2
<a href="#">MTH 201</a>	Linear Algebra	3	0	1	6	3
<a href="#">PHY 201</a>	Waves and Introductory Optics	3	0	1	6	3
<a href="#">PHY 203</a>	General Physics Laboratory II	0	3	0	0	1
<b>Total</b>		<b>17</b>	<b>09</b>	<b>05</b>	<b>34</b>	<b>20</b>

### IV Semester

Course No.	Course Name	LecHr	Lab Hr	Tut Hr	SS Hr	Credit
<a href="#">BIO 202</a>	Molecular Biology and Developmental Biology	3	0	1	6	3
<a href="#">BIO 204</a>	General Biology Laboratory IV	0	3	0	0	1
<a href="#">CHM 222</a>	Classical Thermodynamics	3	0	1	6	3
<a href="#">CHM 224</a>	Physical Chemistry Laboratory I	0	3	0	0	1
<a href="#">EES 202</a>	Foundation of Earth Sciences: Part 2 (Introduction to Rock Deformation and Plate Tectonics)	3	0	1	6	3
<a href="#">HSS 207</a>	Macroeconomics	1	0	0	2	1
<a href="#">MTH 202</a>	Multivariable Calculus	3	0	1	6	3
<a href="#">PHY 202</a>	Quantum Physics	3	0	1	6	3
<a href="#">PHY 204</a>	General PHY Lab III	0	3	0	0	1
<a href="#">CDS 202</a>	Information for Science and Technology	2	0	0	4	2
<b>Total</b>		<b>18</b>	<b>09</b>	<b>05</b>	<b>36</b>	<b>21</b>

## **BS-MS SYLLABUS, HUMANITIES AND SOCIAL SCIENCES**

### **HSS 101: English for Communication (2)**

#### ***Learning Objectives:***

In this course students will learn the importance of and strategies for effective communication. The course is aimed at giving students basic English skills and to improve their existing skills to enable them to communicate effectively in their professional lives. It will give them an overview of the importance of good communication, processes and the different kinds of communications used. It will help students to develop and improve the four communication activities: listening, speaking, reading and writing, teaching them skills and strategies for effective communication through these different modes. Language skills, common grammatical mistakes etc will also be addressed. The course is aimed at giving students an understanding of the processes and challenges of communication, while simultaneously offering opportunities for an application and practice based learning, which will help them to practically implement their theoretical knowledge in communication studies in practical situations.

#### ***Course Contents:***

*Communication Skills:* Process of communication; Different types of communication: Formal and Informal, Oral and Written, Verbal and Nonverbal Communication; Body language and its significance in communication

*Reading Skills:* Process of reading; Ways to improve reading skills; Reading comprehension skills: Practice exercises

*Language Skills:* Common grammatical mistakes: Sentence fragments, Comma splice, Run-together fused sentences; Faulty agreement and reference of pronouns; Errors of number and structure, Shifts in point of view; Mixed constructions; Articles; Identifying grammatically incorrect sentences and correcting them: Exercises

*Speaking Skills:* Importance of speaking in professional life; Common mistakes while speaking; Strategies for effective speaking; Types of speaking; Different speaking activities: Oral presentations: Different types of presentations, Planning and delivering effective presentations; Group discussion: Strategies and mistakes; Interview; Speaking practice and activities

*Listening Skills:* Importance of good listening skills; Process of listening; Barriers to listening; Effective listening, Listening practice: Note-taking, answering questions after listening.

*Writing Skills:* Formal writing; Paragraph writing; Summary writing; Technical writing: Qualities and aims; Letter Writing: Qualities and goals, Types of letters; Resume and Job application; Emails and Netiquette; Combination of different communication skills like reading and writing, and listening and writing; Summarising main ideas/arguments after reading and listening

#### ***Selected Readings***

- Meenakshi Raman & Sangeeta Sharma, *Technical Communication: Principles and Practice* (Oxford University Press, 2011)

- Matthukutty M Monippally, *Business Communication Strategies* (Oxford University Press, 2011)
- Andrea J. Rutherford, *Basic Communication Skills for Technology* (Pearson Education, 2010)
- M Ashraf Rizvi, *Effective Technical Communication* (Tata McGraw- Hill, 2005)

## **HSS 103 : Basic Communication Skills (1)**

### ***Learning Objectives:***

The main objective of this course is to install the significance of developing clear, concise and confident communication skill, either through written or oral. Students will learn how to develop that crisp and confident sound that sets them apart from other students nationally and globally. The communication skills students will learn can be applied to one-on-one conversations, team meetings, interviews and presentations.

### ***Course Contents:***

- **Communication Skills:** Process of Communication, Principles of Communication, Barriers to Communication, Ways to avoid barriers, Oral and Written Communication, Verbal and Nonverbal Communication
  
- **Reading Skills:** Process of Reading, way to improve reading skills Reading Comprehension skills, searching for information; drawing information and making generalizations.
  
- **Language Skills:** Common Grammatical Mistakes, Diction, Strategies: Economy, emphasis, Clarity, concreteness, unity and coherence, etc.
  
- **Spoken Language Skills:** Descriptive, narrative, argumentative and expository techniques in spoken language use
  
- **Listening Skills:** Importance and Process of Listening, Types of Listening, Barriers to Listening

### ***Suggested Readings :***

1. Ian Tushovsky (2018). 21 days of effective communication: everyday habits and exercises to improve your communication skills and social intelligence.
2. Alan Barker (2011) Improve your communication skills. Kogan Page Ltd.
3. Andrea J. Rutherford, Basic Communication Skills for Technology, Pearson Education. Inc., Eleventh edition, 2010
4. Matthukutty M Monippally, Business Communication Strategies, Oxford University Press, Sixth Edition 2011
5. Meenakshi Raman & Sangeeta Sharma, Technical Communication, Oxford University Press, Sixth Edition 2011

## **HSS 104 : Oral and Written Communication [1 Credit course - 10 hrs]**

### ***Learning Objectives:***

The main objective of this course is to improve oral and written communication skills of the students. This course is further expansion of the HSS 103 which students had in previous semester. The communication skills students will learn can be applied to one-on-one conversations, team meetings, interviews and presentations. This course will include hands-on exercise and role plays.

### ***Course Contents:***

- **Writing Skills** : Developing a composition using various techniques like definition, classification, analogy, etc.; Introduction to descriptive narrative, argumentative and expository techniques in writing; and technical writing, etc.
- **Report Writing** :Types of report, Writing Techniques and Guidelines, Drafting, preparation analysis and interpretation of reports.
- **Letter Writing**: Body Language of a letter, and types of letters, Resume and Job application Netiquettes, Review Writing, Writing Notices, Circulars and Proposals
- **Speaking Skills** :Oral Presentation, Interview Skills, Public Speaking, Kinds of Group Discussion, Debate

### ***Suggested Readings :***

1. Ian Tushovsky (2018). 21 days of effective communication: everyday habits and exercises to improve your communication skills and social intelligence.
2. Alan Barker (2011) Improve your communication skills. Kogan Page Ltd.
3. Meenakshi Raman and Sangeeta Sharma, Technical Communication, Oxford University Press, Sixth Edition 2011
4. M Ashraf Rizvi, Effective Technical Communication, TMH, 2005
5. R C Sharma and Krishna Mohan, Business Correspondence and Report Writing, TMH, 2002

## **HSS 202: Fundamentals of Physical Education & Well-Being**

### ***Learning Objectives:***

Objective of this course is to introduce students about health and physical education with a scientific approach. Inculcate the importance of maintaining a healthy-active lifestyle. Impart a fair understating of Yoga for mental well-being.

Lecture #1: Importance of Physical Education (PE). Why study PE? Objectives, Benefits of PE, Fundamentals of wellness and a discussion on the course structure.

### ***Course Contents:***

#### 1. Physical Education: World and Indian history (Lecture 2 & 3)

- 1.1 Brief of world and Indian history of PE
- 1.2 Play and sports, sports for all and role of UNICEF

#### 2. Philosophical, physiological, psychological, social basis of PE (Lecture 4 & 5)

- 2.1 Philosophies of PE.
- 2.2 Physiological, psychological, social fundamentals of PE.

#### 3. Components, conditioning & concept of physical fitness (Lecture 6-9)

- 3.1. Endurance, Strength endurance, Muscular strength, Flexibility, Speed and Co-ordination.
- 3.2. Muscle physiology and different approaches during exercises and Body types.
- 3.3 Basics of strength training. Major muscle groups & functions

#### 4. Energy systems during physical activity, nutrition & balanced diet (Lecture 10-13)

- 4.1 ATP-CP, Lactic acid and Aerobic energy system
- 4.2 Micro and Macro nutrients, water, hydration, water intoxication
- 4.3 Training zone – resting heart rate, Maximum heart rate
- 4.4 Relationship of exercise and nutrition (Pre-exercise meals, carbohydrate loading)

#### 5. Exercise physiology (Lecture 14 & 15)

- 5.1 Acute and chronic responses of exercises
- 5.2 Effects of physical activities/exercise on different systems

#### 6. Posture and Postural deformities (Lecture 16 & 17)

- 6.1 Definition of posture, Types of posture, Postural deformities
- 6.2 Role of posture in the management of Obesity and other Health Ailments

#### 7. Theory and practice of Yoga (Lecture 17-19)

- 7.1 Introduction to Yoga essentials: Meaning & definition of Asana and Pranayama.
- 7.2 Ashtang Yoga: Yama, Niyama, Asana, Pranayama, Pratyahara, Dharana, Dhyana, Samadhi.
- 7.3 Meditation and Breathing techniques

8. Basic principles of designing a workout routine (Lecture 20)
9. Sport injuries: prevention & management (Lecture 21)

***Practical Sessions (1-hour sessions):***

1. Warming up and Limbering down
2. Basic rules and demonstration of Football
3. Basic rules and demonstration of Basketball
4. Basic rules and demonstration of Cricket
5. Basic rules and demonstration of Volleyball
6. Basic rules and demonstration of Badminton
7. Basic rules and demonstration of Athletics: I (Track based)
8. Basic rules and demonstration of Athletics: II (Field based)
9. Yoga demonstration: I (Asanas)
10. Yoga demonstration: II (Pranayama)
11. First Aid basic procedures: CPR, Lifesaving skills and Injury management
12. Viva/ demonstration-based examination

***Course details and Assessment guidelines :***

1. A 4-credit mandatory course consists of theory and practical
2. Offered to BS-MS 2<sup>nd</sup> Year.
3. Total 40 Hours (21 Hrs Theory + 12 Hrs Practical + 7 Hrs Yoga/ Meditation/ Assessment)
4. Total Marks 100
5. Written test (40 marks)
6. Attendance, Punctuality & Discipline (10 marks)
7. Practical/demonstrations (50 marks)

## **HSS 205: Microeconomics (2)**

- Introduction: Households, Firms and Markets
- Households: Utility maximisation; Demand functions
- Firms: Production Functions; Cost Functions; Profit maximisation
- Supply & demand: Types of markets
- Marketing Strategies

*Introduction:* Positive and normative economics; total, average and marginal functions; elasticity

*Households as consuming units:* Indifference curves and the rate and elasticity of substitution; utility maximizing equilibrium; income and substitution effects; demand curves and consumer surplus; Engel curves; demand functions; price, cross and income elasticities of demand

*Firms as producing units:* Production functions: diminishing returns; isoquants; elasticity of substitution; cost minimisation; cost functions and returns to scale; profit maximization

*Supply and demand:* Prices as parameters in perfectly competitive markets; competition and price discovery; market equilibrium under monopolistic competition, monopoly and monopsony; oligopoly

*Marketing strategies:* Marketing functions; objectives of marketing management; levels and patterns of market segmentation; product life cycles

### ***Suggested Books:***

- Varian, Hal R. Intermediate Microeconomics (W.W.Norton, Eighth edition, 2009)
- Bernheim, B. Douglas & Whinston, Michael D. Microeconomics (TMH, Second edition, 2013)
- Pindyck, Robert S. & Rubinfeld, Daniel L. Microeconomics (PHI, Eighth Edition, 2012)
- Browning, Edgar K. & Zupan, Microeconomic Theory and Applications (Wiley, Eleventh edition, 2011)
- Kotler, Philip. Marketing Management (Prentice Hall, Fourteenth Edition, 2011)

## **HSS 206: Introduction to Psychology (1)**

What Psychology is about - fields and applications of Psychology; Perspectives and approaches; Methods of psychology; Perception: Attention; Perceptual organization; Pattern and object perception; Psychophysics; Learning: the major theories and models of learning; Memory: the main models. Forgetting. Applications of memory-related concepts; Emotions - physiological and cognitive theories; Individual differences: Personality - major theories and personality assessment. Intelligence - main models and ability assessment; Genetic and environmental bases.

### ***Suggested Books:***

- Baron, R.A. (2001) Psychology (5th edition). Pearson Education, New Delhi
- Nolen-Hoeksema, S., Fredrickson, B.L., Wagenaar, W.A. & Lofus, G. R. (2009) *Atkinson & Hilgard's Introduction to Psychology*. (15th edition) Cengage (Indian edition)

## **HSS 207: Macroeconomics (1)**

- Introduction
- Consumption, saving and investment functions
- Joint equilibrium in goods and financial markets
- Inflation and unemployment
- Open economy macroeconomics

*Introduction:* Macroeconomic aggregates; sectoral contributions to domestic product; international comparisons and purchasing power parity; closed and open economies

*Consumption, saving and investment functions:* Average and marginal propensities to consume and save; aggregate demand; the simple Keynesian closed economy equilibrium; the multiplier; government consumption and taxation

*Joint equilibrium in goods and money markets:* Demand for liquidity; the IS-LM model

*Inflation and unemployment:* Measurement of inflation; inflationary expectations and aggregate demand; the aggregate supply curve; the expectations-augmented Phillips curve; measuring unemployment in India

*Open economy macroeconomics:* External and internal balance; the Balance Payments; trade tariffs, nominal and effective rates of protection; non-tariff barriers

### ***Suggested Books:***

- Dornbusch, Rudiger, Stanley Fischer and Richard Startz. Macroeconomics (TMH, Eleventh edition, 2010)
- Olivier Blanchard. Macroeconomics (PHI, Fifth Edition, 2010)
- N. Gregory Mankiw. Macroeconomics (Worth Publishers, Seventh edition, 2010)

## HSS 209 : Technical Writing (2)

### **Learning Objectives:**

The main objective of this course is to equip students with the concepts, principles, as well as nuts-n-bolts of technical writing. This course includes hands-on exercises and role plays, e.g. contact creator, author, editors, etc. At the completion of this course, student will be able to write thesis, scientific paper and technical paper with minimal inputs from advisor(s) and/or expert(s).

### **Course Contents:**

This course includes introduction to technical writing, the process of writing, do's & don'ts of technical writing, elements of style, types of technical writing etc.

- **Introduction to Technical Writing:** Definition of technical writing; Basic principles in technical writing; characteristics of effective technical writing and other types of writing
- **The Process of Writing: Four-step process for technical writing** :analyse, organize, write, and revise. Understanding audience/readers, collecting and organizing information and drafting information verbally and visually. Techniques of paragraph development. Using Illustrations-purpose and qualities of visuals.
- **Elements of Style:** Identifying and avoiding common grammatical errors, use of proper punctuation, word choice, words and expression commonly misused and words often misspelled. Formal academic writing style-Clarity, precise, familiar and forthright. Avoiding impediments to writing and academic dishonesty /plagiarism.
- **Technical Writing (Report, Proposal, Review& Research Paper):** Formal Technical Reports and Informal Reports: Front Matter, Main body and Back Matter. Citation/ Referencing style (APA/Chicago/ Harvard) Writing a procedure, describing machines/ processes and writing instructions. Types of review and edit; review and editing methodology Format: Typography and layout of documents Writing research proposals, research papers, abstracts and smart e-mails.
- **Exercise:** State of the art reviews on topics related to science, technology, nature, conservation, education, social behaviour etc.

### **Suggested Readings :**

1. Alred et.al. (2015). Handbook of technical writing (11th edition) by Bedford/ St.Martins.
2. Atkinson and Corbitt (2021). Mindful technical writing. 2021 edition, Montana University System.

3. The Elements of Style-William Strunk Jr. and E. B. White. (Pearson Education, Inc.)
4. Technical Communication: A Practical Approach - William Sanborn Pfeiffer and T.V.S Padmaja (Pearson Education, Inc.)
5. Technical Communication: Principles and Practice - Meenakshi Raman and Sangeeta Sharma (Oxford University Press).

## HSS 302: Literature of the Indian Diaspora (3)

### **Learning Objectives:**

This course will examine the work of some recent authors of the Indian diaspora in Britain and North America to uncover the changing historical, political, socioeconomic, and cultural contexts of migration from the Indian subcontinent, from the nineteenth century to the present day. The course aims to study, in relation to some contemporary Indian diasporic writing, the postcolonial thematics of diaspora literature, the relation between geography and form, between location and representation, and how these various factors determine the writing and reception of literature. After doing this course, students will have an understanding of issues of diaspora, location, history and geography in literature, and an awareness of the relationship between literary texts and their historical, political and cultural contexts. They will also gain an insight into the complex, traumatic and fragmented history of South Asia, which led to territorial, national and cultural reformulations, which in turn shaped modern South Asian cultural imaginaries of home, identity and belonging.

### **Course Contents:**

In this course, we will study the fiction of some recent and contemporary Indian diasporic writers like Salman Rushdie, Rohinton Mistry, Amitav Ghosh, Jhumpa Lahiri and Kiran Desai. The following issues and concerns will be examined in relation to their fiction:

- Issues of diaspora, location, history and memory in literature
- The relationship between literary texts and their historical, political and cultural contexts
- The relationship between geography and form, between location and representation
- The experiences of dislocation, relocation, acculturation and marginalization as explored and addressed in their works
- These writers' configurations of the notions of home, cultural identity and belonging
- How these notions of home and cultural identity are changing across generations of diasporic writers
- How postcolonial migrancy has radically reformulated and redefined earlier dynamics of migration, creating new relations between cultures of origin and adoption
- How the nature and scale of subcontinental migration changed, since the mid twentieth century, due to the effects of decolonization, transnationalism, and rapid globalization, from the earlier nineteenth century model of diaspora, which had its origins in the colonial history of indenture, and how the desire for economic and professional advancement in the West, especially in Britain and North America, became the dominant impulse behind subcontinental migration, in the latter half of the twentieth century, in comparison with the earlier nineteenth century diasporic imaginary characterised predominantly by loss and disempowerment

### **Selected Readings**

- **Primary Reading:**
  1. Salman Rushdie, *Midnight's Children* (1980)
  2. Rohinton Mistry, *Family Matters* (2003)
  3. Amitav Ghosh, *Sea of Poppies* (2008)
  4. Kiran Desai, *The Inheritance of Loss* (2006)
  5. Jhumpa Lahiri, *Unaccustomed Earth* (2008)
- **Critical Reading:**
  1. Vijay Mishra, *Literature of the Indian Diaspora: Theorizing the Diasporic Imaginary*

## 2. AvtarBrah, *Cartographies of Diaspora: Contesting Identities*

## **HSS 303: Introduction to Game Theory (3)**

### ***Learning Objectives:***

1. Rational decision making, utility function and the case of uncertainty.
2. The definition of a game, complete information, static games.
3. Nash equilibrium in pure and mixed strategies.
4. Extensive-form games, game trees, subgame perfect Nash equilibrium.

### ***Course Contents:***

*Rational decision making, utility function and the case of uncertainty:* preference relations, rationality, existence of utility functions, rational choice paradigm, uncertainty, lotteries, von Neumann-Morgenstern expected utility function, decision making under uncertainty, value of information.

*The definition of a game, complete information, static games:* normal-form games, pure strategies, mixed strategies, examples of games like prisoner's dilemma, rock-paper-scissors, Cournot duopoly, dominated strategies, beliefs, best responses, solutions concepts like iterated elimination of strictly dominated pure strategies, rationalizability.

*Nash equilibrium in pure and mixed strategies:* definition of Nash equilibrium in pure and mixed strategies, existence of Nash equilibrium, Cournot duopoly, Bertrand duopoly, median voter theorem.

*Extensive-form games, game trees, subgame perfect Nash equilibrium:* perfect and imperfect information, mixed and behavioural strategies, game trees, sequential rationality, backward induction, subgame perfect Nash equilibrium, centipede game, Stackelberg competition, finitely and infinitely repeated games, the folk theorem, strategic bargaining, contracts

*Incomplete information, Bayesian games:* Player's preference type, common prior, static and dynamic games of incomplete information, Bayesian Nash equilibrium, perfect Bayesian equilibrium, sequential equilibrium, adverse selection and signaling, auctions.

### ***Selected Readings***

- *Game Theory: An Introduction* by Steven Tadelis (Princeton University Press)
- *An Introduction to Game Theory* by Martin J. Osborne (Oxford University Press)
- *A Course in Game Theory* by Osborne and Rubinstein (MIT Press)
- *Game Theory* by Fudenberg and Tirole (MIT Press)
- *Microeconomic Theory* by Mas-Colell, Whinston and Green (Oxford University Press)

## HSS 304: Applied Econometric Analysis (3)

### **Learning Objectives:**

1. The nature of econometrics and economic data.
2. The simple regression model and properties of OLS estimators
3. Multiple regression analysis - Estimation and Inference
4. Multiple regression analysis with Binary (dummy) variables
5. Basic regression analysis with time series data.
6. Statistical analysis with R programming.

### **Course Contents:**

*The nature of econometrics and economic data:* definition of econometrics; cross-sectional data; time series data; panel data; causality; ceteris paribus.

*The simple regression model and properties of OLS estimators:* Deriving the ordinary least squares (OLS) estimates; fitted values, residuals and goodness-of-fit; units of measurement and functional form; unbiasedness and variances of OLS estimators; regression through origin.

*Multiple regression analysis- Estimation and Inference:* Deriving OLS estimates; interpreting the OLS regression equation; OLS fitted values, residuals and goodness-of-fit; omitted variable bias; multicollinearity; standard error of OLS estimators; efficiency of OLS – Gauss-Markov theorem; Testing hypotheses against one-sided alternatives, two-sided alternatives; p-value, t-test, F-test, confidence intervals; reporting linear regression results.

*Multiple regression analysis with Binary (dummy) variables:* using dummy variables for multiple categories; interactions among dummy variables; testing for differences in regression functions across groups; the linear probability model.

*Basic regression analysis with time series data:* Static models; finite distributed lag models; Gauss-Markov theorem; functional form, dummy variables and index number; trends and seasonality.

*Statistical analysis with R programming:* Upload, read, modify, create data; writing codes to run regressions; computing p-values, confidence intervals; plotting graphs

### **Selected Readings**

- Main text book: Introductory Econometrics: A modern approach by Jeffrey M. Wooldridge (Cengage India) (Chapter 1- Chapter 2, Chapter 3, Chapter 4, Chapter 7, Chapter 10)
- Econometric Analysis by William H. Greene (Pearson)
- Microeconometrics: Methods and Applications by A. Colin Cameron and Pravin K. Trivedi (Cambridge)
- Principles of Econometrics- An Introduction using R by Neeraj R. Hatekar (Sage texts)

## **HSS 305:Introduction to Industrial Organisation (3)**

### ***Learning Objectives:***

The course aims to familiarise students with the structure, conduct and performance of industries in a market. Structure means how sellers interact with other sellers, with buyers, and with potential entrants. Market conduct refers to the behavior of the firms in a given market structure, that is, how firms determine their price policy, sales, and promotion. Since we will be studying interactions of sellers with one another, topics from game theory would be covered in the course to understand the strategies adopted by each seller to maximize profits. After completing this course, students would have a better understanding of how industry is organized in a given market structure.

### ***Course Contents:***

- Introduction – The Study of Industrial Organisation
- Technology, Production Cost and Demand: Technology and cost, The demand function
- Perfect Competition: Non-Increasing Returns to Scale, Increasing Returns to Scale, Marginal-Cost Pricing and Social Welfare
- Basic Concepts in Non-Cooperative Game theory: Normal Form Games, Extensive Form Games, Repeated Games
- Monopoly: The Monopoly's Profit-Maximization Problem, Monopoly and Social Welfare, Discriminating Monopoly, First Degree Price Discrimination, Second Degree Price Discrimination, Durable-Goods Monopolies
- Markets for Homogeneous Products: Cournot Market Structure, Sequential Moves Bertrand Market Structure, Cournot versus Bertrand, Self-Enforcing Collusion
- Markets for Differentiated Products: Two Differentiated Products, Monopolistic Competition in Differentiated Products, Location Models
- Concentrations, Mergers and Entry Barriers: Concentration Measures, Mergers, Entry Barriers, Contestable Markets
- Research & Development: Classifications of Process Innovation, Innovation Race, Cooperation in R&D, Patents

### ***Selected Readings***

- Industrial Organization Theory and Applications by Oz Shy (MIT Press)
- Intermediate Economics Eighth Edition by Hal Varian.
- The Theory of Industrial Organization by Jean Tirole (MIT Press)
- Advanced Microeconomics Theory by Jehle and Reny (Pearson)

## **HSS 306:Socratic Method (1)**

### ***Learning Objectives:***

In this course, students will be exposed to various aspects of the process of discussion with a special focus on those aspects that determine the effectiveness of a discussion.

### ***Course Contents:***

Importance of discussion in our personal and professional life, Difference between discussion and interactive session, Measure of effectiveness of a discussion, Role of the moderator, Skillset of an effective moderator, Aspects of discussion in large groups, Teaching through discussions, Pros and cons of the Socratic Method.

### ***Selected Readings:***

- D. Willingham, *Why don't students like school?* (Jossey-Bass, New York, 2010)
- D. Bohm, *On Dialogue* (Routledge, New York, 1996)

### ***Papers:***

- K. Shah, "Methods for teaching traditional physics". *Physics Today* 69, 12 (2016)

## **HSS 503: Law Relating to Intellectual Property and Patents (1)**

*The Course will begin with a general discussion on Law relating to Intellectual Property (hereinafter, 'IP') and then move on to discuss Law relating to Patents in particular.*

*The objectives of the Course is to make the students of Science and Technology aware of:*

- a. *the meaning and significance of IP in the knowledge society in which the power of mind rules supreme,*
- b. *the distinctive features of different types of IP, for, it has been observed that even educated people including scientists use the terminologies of IP indiscretly, e.g., phrases like "patenting of geographical indications,"*
- c. *whether IP in general and patents in particular help in the production of new knowledge and technology,*
- d. *whether IP and patents can help freedom from colonization of mind, and*

*whether patents are the measure of progress and development of a country.*

Some of the objectives of the Course may seem to be too idealistic at first sight but they are not really so.

A tentative outline of the Course is as under:

1. Relevance of "Law relating to Intellectual Property and Patents" for the students of Science and Technology
2. Meaning and Characteristics of Intellectual Property Rights
3. Types of Intellectual Property Rights
4. Meaning and Characteristics of Patent
5. Substantive Patent Law
  - A. Patentable Subject Matter
  - B. Novelty
  - C. Inventive Step
  - D. Capability of Industrial Application
6. Procedural Patent Law
  - A. When to go for a patent?
  - B. Where to go for a patent?
  - C. How to go for a patent?
    - i. Patent Application
    - ii. Specification
      - a. Written Description
      - b. Enablement
      - c. Best Mode
      - d. Claim(s)

The above-mentioned points may be covered in ten to twelve hours depending on the level of dicussion in the class.

### ***Suggested Books:***

- W. R.Cornish, Intellectual Property: Patents, Copyright, Trade Marks, and Allied Rights, 4th Ed. (London: Sweet & Maxwell, 1999).
- D.Vaver,Intellectual Property Rights: Critical Concepts in Law (London; New York: Routledge, 2006).
- ToshikoTakenaka, Patent Law and Theory: A Handbook of Contemporary Research (Cheltenham: Edward Elgar, 2008).

- Graham Dutfield, Intellectual property rights and the Life Science Industries: A Twentieth Century History (Hampshire: Ashgate, 2003).
- Donald S Chisum, Principles of Patent Law: Cases and Materials (New York: Foundation Press, 2001).
- Donald S Chisum, Chisum on Patents: A Treatise on the Law of Patentability, Validity, and Infringement (New York: Lexis Pub., 1978).
- Melville B Nimmer & David Nimmer, Nimmer on Copyright: A Treatise on the Law of Literary, Musical and Artistic Property, and the Protection of Ideas (New York: M. Bender, 1978).
- Ernest Bainbridge Lipscomb, et al; Walker on Patents (Rochester, N.Y.: Lawyers Co-operative Pub. Co., 1984).
- Walter Arthur Copinger & E. P. Skone James, Copinger and Skone James on Copyright, (London: Sweet & Maxwell, 1999).
- Gregory A. Stobbs, Software Patents (Gaithersburg: Aspen Law & Business, 2000).

## **HSS 504: Law Relating to Intellectual Property and Patents (1)**

*The Course will begin with a general discussion on Law relating to Intellectual Property (hereinafter, 'IP') and then move on to discuss Law relating to Patents in particular.*

*The objectives of the Course is to make the students of Science and Technology aware of:*

- a. *the meaning and significance of IP in the knowledge society in which the power of mind rules supreme,*
- b. *the distinctive features of different types of IP, for, it has been observed that even educated people including scientists use the terminologies of IP indiscretly, e.g., phrases like "patenting of geographical indications,"*
- c. *whether IP in general and patents in particular help in the production of new knowledge and technology,*
- d. *whether IP and patents can help freedom from colonization of mind, and*

*whether patents are the measure of progress and development of a country.*

Some of the objectives of the Course may seem to be too idealistic at first sight but they are not really so.

A tentative outline of the Course is as under:

1. Relevance of "Law relating to Intellectual Property and Patents" for the students of Science and Technology
2. Meaning and Characteristics of Intellectual Property Rights
3. Types of Intellectual Property Rights
4. Meaning and Characteristics of Patent
5. Substantive Patent Law
  - A. Patentable Subject Matter
  - B. Novelty
  - C. Inventive Step
  - D. Capability of Industrial Application
6. Procedural Patent Law
  - A. When to go for a patent?
  - B. Where to go for a patent?
  - C. How to go for a patent?
    - i. Patent Application
    - ii. Specification
      - a. Written Description
      - b. Enablement
      - c. Best Mode
      - d. Claim(s)

The above-mentioned points may be covered in ten to twelve hours depending on the level of discussion in the class.

### ***Suggested Books:***

- W. R. Cornish, Intellectual Property: Patents, Copyright, Trade Marks, and Allied Rights, 4th Ed. (London: Sweet & Maxwell, 1999).
- D. Vaver, Intellectual Property Rights: Critical Concepts in Law (London; New York: Routledge, 2006).
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- Donald S Chisum,Chisum on Patents:A Treatise on the Law of Patentability, Validity, and Infringement(New York: Lexis Pub., 1978).
- Melville BNimmer&DavidNimmer,Nimmer on Copyright:A Treatise on the Law of Literary, Musical and Artistic Property, and the Protection of Ideas(New York: M. Bender, 1978).
- Ernest Bainbridge Lipscomb, et al; Walker on Patents (Rochester, N.Y.: Lawyers Co-operative Pub. Co., 1984).
- Walter ArthurCopinger&E. P.Skone James, Copinger and Skone James on Copyright, (London: Sweet & Maxwell, 1999).
- Gregory A.Stobbs, Software Patents (Gaithersburg: Aspen Law & Business, 2000).