HSNC University Mumbai

(2023-2024)

Ordinances and Regulations

with Respect to

Choice Based Credit System

(CBCS)

For the Programs Under

The Faculty of Science and Technology

For the Course

Logical Reasoning and Quantitative Aptitude
Semester-I and Semester -II (w.e.f. 2023-2024)

under NEP 2020

Board of Studies in Mathematics

1. **Name of Chairperson**
   Mrs. Usha G. Hemasundar ,Head, Department of Mathematics, M Sc Mathematics Associate Professor, K. C. College Ph: 9892234921 Email id: usha.gollakota@kccollege.edu.in
   Name of Co-Chairperson
   Ms. Shubhada Kanchan, MSc Mathematics,Department of Mathematics and Statistics Assistant Professor, H. R. College,Ph: 9975673087 Email id: shubhadark@yahoo.co.in

2. **Two to five teachers each having minimum five years teaching experience amongst the full-time teachers of the Departments, in the relevant subject.**
   a.) Dr. Pankit Gandhi, MSc (Mathematics), M Phil, Ph.D., LL.B., Associate Professor, K. C. College, Ph: 8169381936 Email id: pankit.gandhi@kccollege.edu
   b.) Mrs. Vijayalaxmi Suvarna ,M Sc Mathematics, M.Phil ,Assistant Professor,H. R. College, Ph: 9987395783; Email id: vijayalaxmi_suvarna@rediffmail.com
   c.) Mrs. Mrunal Hardikar ,M Sc Mathematic, Assistant Professor, K. C. College, Ph: 9653227252; Email id: mrunal.hardikar@kccollege
   d.) Mrs. Nilesh Bhandarkar ,M Sc Mathematic, Assistant Professor, K. C. College, Ph: 98200868037; Email id:nilesh.bhandarkar@kccollege

3. **One Professor / Associate Professor from other Universities or professor / Associate Professor from colleges managed by Parent Body; nominated by Parent Body;-**
   a.) Dr Sushil Kulkarni , Professor, Head, School of Mathematics,Applied Statistics &Analyticas,NMIMS,PhNo9870126536;Emailid: sushiltry@gmail.comn

4. **External experts from Industry / Research / eminent scholar in the field relevant to the subject nominated by the Parent Body**;
   a.) Dr Ajit Kumar , Ph.D. Mathematics,Associate Professor and Head, Department of Mathematics, Institute of Chemical Technology, Mumbai,Ph No. 99690 31202; E Mail id ajit72@gmail.com
   b.) Dr. Amiya Ranjan Bhowmick, Ph.D. Applied Mathematics and Statistics; Assistant Professor, Institute of Chemical Technology, Mumbai, Ph no: 08334835300/7738101583; amiyaiitb@gmail.com/ar.bhowmick@ictmumbai.edu.in
   c.) Mr. Prashant Shukla,MSc statistics, Masters in Financial Management JBIMS; Chief Investment Officer, Aston Capital Advisor Pvt Ltd,Partner at HBD Consulting LLP; Ph no:9821470975; Email id: sprash@rediffmail.com
   d.) Mr. Kaushal Shah,M.Com, PGDBA(Finance),Senior Manager, Treasury Reliance Power, Ph no: 9320105703; Email id: krushalshah78@gmail.com

5. **Top rankers of the Final Year Graduate and Final Year Post Graduate examination of previous year of the concerned subject as invitee members for discussions on framing or revision of syllabus of that subject or group of subjects for one year.**

   Ms. Gunjan Shinde, B Sc, Mathematics, Currently pursuing online Degree in data Science and Programming from IIT ,Madras

Syllabus for General Elective -1
Offered to FYB Com /FYBA by BoS (Mathematics)

General Elective -1 (Semester I)

GE Course Preamble:

In today's world, many graduate students are required to give some form of competitive exam to pursue higher studies or apply for jobs. Logical reasoning and quantitative aptitude are two basic skills that higher institutes and prospective employers expect from the student applicant. By offering this course we wish to inculcate these skills in our students so that they are prepared for such exams alongside their regular studies.

Semester-I

Course Title: Logical Reasoning and Quantitative Aptitude I

Course Objectives:

1. Learners will develop strong skills in critical and logical thinking.
2. Learners will understand the historical evolution of numbers and appreciate the beauty of their patterns.

Course Outcome:

1. Learners will be able to apply thinking skills to identify logical fallacies in the content spread by media, make wise personal decisions and be a well-informed citizen.
2. Learners will be able to use their knowledge of numbers to solve many real-life problems and recognize number patterns. They will also use various counting techniques to effectively count the number of possibilities with the given condition.

Evaluation Pattern:

The course will be assessed for a total of 50 marks and will consist of:

- **Summative Assessment** (End Semester Theory Exam): 30 **marks**.
  Paper Pattern:

  Q1: Objective questions based on both units. (10 marks)
  Q2: Unit I: Attempt any two out of four (10 marks)
  Q3: Unit II: Attempt any two out of four (10 marks)

- **Formative Assessment: 20 marks.**
  (Self-Learning Evaluation – 15 marks (Can be in the form of a class assignment or a home assignment or a case study) and Class performance – 5 marks)

Detailed Syllabus

Unit	Content	No. of Lectures
1	**1. Logic, Sets and Venn Diagrams** **1.1** Propositions, truth values and implications. **1.2** Logical equivalence, Tautology, Contradiction and contrapositive statements. **1.3** Inductive and deductive proofs. **1.4** Sets, compliment, union and intersection. **1.5** Venn diagrams	**15**
2	**2. Numbers in real world** 2.1. Integers, fractions, ratio and proportion, unit conversion. 2.2. Irrational numbers, π, $\sqrt{2}$, working with surds, concept of infinity. 2.3. Exponents, powers of 10 and logarithms. 2.4. Counting Techniques: Addition and multiplication principle, Inclusion-Exclusion principle.	**15**

Self-Learning topics (Unit wise)

Unit	Topics
2	2.3 Exponents
2	2.5. Counting Techniques: Addition and multiplication principle, Inclusion-Exclusion principle.

Resources for Self-Learning

1. Using and Understanding Mathematics: A quantitative Reasoning Approach: 7th edition – Bennett and Briggs (Pearson) Chapter 2.
2. The Art and Craft of problem-solving (Second edition) – Paul Zeitz (John-Wiley & Sons, Inc) Chapter 6

Reference Books

1. Mathematics for the nonmathematician – Morris Kline (Dover Publications) (Chapters 3,4)
2. Using and Understanding Mathematics: A quantitative Reasoning Approach: 7th edition – Bennett and Briggs (Pearson) (Chapters 1,2,3)
3. Professor Stewart's Incredible Numbers- Ian Stewart (Profile Books) (Chapters 1,2,0, $\frac{1}{2}$, $\sqrt{2}$, π)
4. One Two Three … Infinity – George Gamow (Dover Publications) (Chapters 1 and 2)
5. The art of problem solving: Introduction to Algebra – Richard Rusczyk (AoPS) (Chapters 6 and 7).
6. Mathematical Reasoning: Writing and Proof Version 2.1 – Ted Sundstorm (Creative Commons) (Chapters 1,2,5)
7. The art of problem-solving Volume 1: The Basics- Sandor Lechoczky, Richard Rusczyk (AoPS Incorporated) (Chapters 1,4,8,25,27)

8. The Art and Craft of problem-solving (Second edition) – Paul Zeitz (John-Wiley & Sons, Inc) (Chapters 2, 5 and 6)
9. How the Other Half Thinks: Adventures in Mathematical Reasoning – Sherman Stein (Chapter 7)

Semester II
General Elective -I
Course Title: Logical Reasoning and Quantitative Aptitude II

Course Objectives:

1. Learners will develop the skill to read news reports of statistical studies involving tables, charts and graphs.
2. Learners will be introduced to basic ideas of probability.

Course Outcome:

1. Learners will be able to read news reports of statistical studies in a way that will allow them to evaluate them critically and decide whether and how they affect learner's personal beliefs.
2. Learners will be able to quantify risks and uncertainties in real-life, required to make optimal decisions.

Evaluation Pattern:
The course will be assessed for a total of 50 marks and will consist of:

- **Summative Assessment** (End Semester Theory Exam): 30 **marks**.
  Paper Pattern:

  Q1: Objective questions based on both units. (10 marks)
  Q2: Unit I: Attempt any two out of four (10 marks)
  Q3: Unit II: Attempt any two out of four (10 marks)

- **Formative Assessment: 20 marks.**
  (Self-Learning Evaluation – 15 marks (Can be in the form of a class assignment or a home assignment or a case study) and Class performance – 5 marks)

Detailed Syllabus

Unit	Content	No. of Lectures
1	**1. Statistical Reasoning** 1.1 Fundamentals of statistics, Population, Sample, Sample Statistics, Steps in Statistical study. 1.2 Common sampling methods. 1.3 Surveys and opinion polls. 1.4 Statistical tables and graphs (Bar graphs, Pie Charts, Histograms and Line graphs) 1.5 Graphics in Media: Few Cautions	**15**
2	**2. Probability: Language of uncertainty** 2.1. Experiment, Outcome, event, Expressing probability as a fraction, Probability of compliment. 2.2. Independent events, Dependent events. 2.3. Non-overlapping events, addition principle, at least and at most concepts 2.4. Expected values, Lottery expectations, Auctions. 2.5. Putting Probability and statistics together: Assessing risk, Life expectancy, law of large numbers, Probability distributions (concept)	**15**

Self-Learning topics (Unit wise)

Unit	Topics
1	1.3 Surveys and opinion polls.
2	2.6 Lottery expectations, Auctions.

Resources for Self-Learning

Using and Understanding Mathematics: A quantitative Reasoning Approach: 7th edition – Bennett and Briggs (Pearson) Chapter 5

Reference Books

1. Mathematics for the nonmathematician – Morris Kline (Dover Publications) (Chapters 22,23)
2. Using and Understanding Mathematics: A quantitative Reasoning Approach: 7th edition – Bennett and Briggs (Pearson) (Chapters 5,7)
3. Mathematics of choice: How to count without counting – Ivan Niven (Random House) (Chapters 2 and 3)
4. The art of problem-solving Volume 1: The Basics- Sandor Lechoczky, Richard Rusczyk (AoPS Incorporated) (Chapter 26)