Teaching Plan: B.Sc. (Hons.) Mathematics, Semester-6

DSC-16: Advanced Group Theory

Weeks 1 to 3: Definition and examples of group actions, Permutation representations; Centralizers and Normalizers, Stabilizers and kernels of group actions.
[1]: Chapter 1 (Section 1.7), and Chapter 4 (Section 4.1, except cycle decompositions).
[1]: Chapter 2 (Section 2.2).

Week 4: Groups acting on themselves by left multiplication and consequences, Cayley's theorem.
[1]: Chapter 4 (Section 4.2).

Weeks 5 and 6: Groups acting on themselves by conjugation, Conjugacy classes, Class equation, Conjugacy in S_n, Simplicity of A_5.
[1]: Chapter 4 (Section 4.3, up to Theorem 12).

Weeks 7 to 9: p-groups, Sylow p-subgroups, Sylow's theorem, Applications of Sylow's theorem, Groups of order pq and of order p^2q (p, q both prime).
[1]: Chapter 4 (Section 4.5, up to page 144).

Weeks 10 and 11: Finite simple groups, Nonsimplicity tests.
[2]: Chapter 25.

Weeks 12 to 14: Solvable groups and their properties, Commutator subgroups, Composition Series, Jordan- Hölder Theorem.
[3]: Chapter 7 (Section 7.6).

Week 15: Nilpotent groups.
[3]: Chapter 10 (Section 10.1, up to page 455).

Essential Readings

1. Dummit, David S., & Foote, Richard M. (2004). Abstract Algebra (3rd ed.). John Wiley & Sons. Student Edition, Wiley India 2016.
2. Gallian, Joseph. A. (2017). Contemporary Abstract Algebra (9th ed.). Cengage Learning India Private Limited, Delhi. Indian Reprint 2021.
3. Beachy, John A., & Blair, William D. (2019). Abstract Algebra (4th ed.). Waveland Press.

DSC-17: Advanced Linear Algebra

Weeks 1 and 2: The change of coordinate matrix; Dual spaces, Double dual, Dual basis, Transpose of a linear transformation and its matrix in the dual basis, Annihilators.
[1]: Chapter 2 (Sections 2.5, and 2.6).

Weeks 3 and 4: Eigenvalues, Eigenvectors, Eigenspaces and characteristic polynomial of a linear operator; Diagonalizability, Direct sum of subspaces.
[1]: Chapter 5 (Sections 5.1, and 5.2)

Weeks 5 and 6: Invariant subspaces and the Cayley-Hamilton theorem; The Jordan canonical form and the minimal polynomial of a linear operator.
[1]: Chapter 5 (Section 5.4 up to Example 7 and corollary, p. 316).
[1]: Chapter 7 (Sections 7.1 [Definitions, and Examples only], and 7.3 with statement of Theorem 7.16)

Weeks 7 to 9: Inner products and norms, Orthonormal basis, Gram-Schmidt orthogonalization process, Orthogonal complements, Bessel's inequality.
[1]: Chapter 6 (Sections 6.1, and 6.2).

Week 10: Adjoint of a linear operator with applications to least squares approximation and minimal solutions to systems of linear equations.
[1]: Chapter 6 (Section 6.3 with statement of Theorem 6.13).

Weeks 11 to 13: Normal, self-adjoint, unitary and orthogonal operators and their properties.
[1]: Chapter 6 (Section 6.4, and Section 6.5 up to Theorem 6.21).

Weeks 14 and 15: Orthogonal projections and the spectral theorem; Singular value decomposition for matrices.
[1]: Chapter 6 (Section 6.6 with outline of the proof of spectral theorem)
[1]: Chapter 6 (From the Section 6.7: Definitions of singular values, and singular value decomposition of a matrix, and statement of Theorem 6.27 with examples).

Essential Reading

1. Friedberg, Stephen H., Insel, Arnold J., & Spence, Lawrence E. (2019). Linear Algebra (5th ed.). Pearson Education India Reprint.

DSC-18: Complex Analysis

Week 1: Functions of a complex variable and mappings.
[1]: Chapter 2 (Sections 13, and 14).

Week 2: Limits, Theorems on limits, Limits involving the point at infinity.
[1]: Chapter 2 (Sections 15 to 17).

Week 3: Continuity and differentiation.
[1]: Chapter 2 (Sections 18 to 20).

Week 4: Cauchy-Riemann equations and examples, Sufficient conditions for differentiability, Analytic functions and their examples.
[1]: Chapter 2 (Sections 21, 22, 23, 25, and 26).

Week 5: Exponential, logarithmic, and trigonometric functions.
[1]: Chapter 3 (Sections 30, 31, 37, and 38).

Week 6: Derivatives of functions, Definite integrals of functions, Contours.
[1]: Chapter 4 (Sections 41, 42, and 43).

Week 7: Contour integrals and examples, Upper bounds for moduli of contour integrals.
[1]: Chapter 4 (Sections 44, 45, and 47).

Week 8: Antiderivatives, and proof of the antiderivative theorem.
[1]: Chapter 4 (Sections 48, and 49).

Weeks 9 and 10: Cauchy-Goursat theorem (without proof), Cauchy integral formula and its extension with consequences; Liouville's theorem and the fundamental theorem of algebra.
[1]: Chapter 4 (Sections 50, 52 to 58).

Weeks 11 and 12: Taylor and Laurent series with examples.
[1]: Chapter 5 (Overview of Sections 60 and 61).
[1]: Chapter 5 (Sections 62 to 66, and 68).

Week 13: Absolute and uniform convergence of power series, Integration, differentiation and uniqueness of power series.
[1]: Chapter 5 (Sections 69, 71, and 72).

Week 14: Isolated singular points, Residues, Cauchy's residue theorem, Residue at infinity, Types of isolated singular points.
[1]: Chapter 6 (Sections 74 to 79).

Week 15: Residues at poles and its examples, An application to evaluate definite integrals involving sines and cosines.
[1]: Chapter 6 (Sections 80, and 81).
[1]: Chapter 7 (Section 92).

Essential Reading

1. Brown, James Ward, & Churchill, Ruel V. (2014). Complex Variables and Applications (9th ed.). McGraw-Hill Education. Indian Reprint.

DSE-4(i): Mathematical Finance

Week 1: Interest rates, Types of rates, Measuring interest rates, Zero rates, Bond pricing.
[1]: Chapter 4 (4.1, and 4.4 to 4.6).

Week 2: Forward rate, Duration, Convexity.
[1]: Chapter 4 (4.8, and 4.10 to 4.11).

Weeks 3 and 4: Exchange-traded markets and Over-the-counter markets, Derivatives- Forward contracts, Futures contracts, Options, Types of traders, Hedging, Speculation, Arbitrage.
[1]: Chapter 1 (1.1 to 1.9).

Week 5: No Arbitrage principle, Short selling, Forward price for an investment asset.
[1]: Chapter 5 (5.1 to 5.4).

Week 6: Types of Options, Option positions, Underlying assets, Factors affecting option prices.
[1] Chapter 10 (10.1 to 10.3), and Chapter 11 (11.1).

Week 7: Bounds for option prices, Put-call parity (in case of non-dividend paying stock only), Early exercise.
[1]: Chapter 11 (11.2 to 11.6).

Week 8: Trading strategies involving options (except box spreads, calendar spreads and diagonal spreads).
[1] Chapter 12 (12.2 to 12.5).

Weeks 9 and 10: Binomial option pricing model, Risk-neutral valuation (for European and American options on assets following binomial tree model).
[1]: Chapter 13 (13.1 to 13.5).

Week 11: Brownian Motion (Wiener Process), Geometric Brownian Motion, The process for a stock price, Itô's lemma.
[1]: Chapter 14 (Only basic idea of 14.2 to 14.4, and 14.6 to 14.7).

Weeks 12 and 13: Lognormal property of stock prices, Distribution of the rate of return, Expected return, Volatility, Estimating volatility from historical data, Derivation of Black-Scholes-Merton differential equation.
[1]: Chapter 15 (15.1 to 15.6).

Week 14: Extension of risk-neutral valuation to assets following GBM (without proof), Black-Scholes formula for European options.
[1]: Chapter 15 (15.7, 15.8, with proof of Black-Scholes formula given in Appendix after the chapter).

Week 15: Hedging parameters - The Greek letters: Delta, Gamma, Theta, Rho and Vega); Delta hedging, Gamma hedging.
[1]: Chapter 19 (19.1-19.9, Only definitions and formulae (without proof) of Greeks).

Essential Reading

1. Hull, John C., & Basu, S. (2022). Options, Futures and Other Derivatives (11th ed.). Pearson Education, India.

DSE-4(ii): Integral Transforms

Weeks 1 and 2: Piecewise continuous functions and periodic functions, Systems of orthogonal functions, Fourier series, Convergence of Fourier series.
[1]: Chapter 6 (Sections 6.1 to 6.5).

Weeks 3 and 4: Examples and applications of Fourier series, Fourier cosine series and Fourier sine series, The Gibbs phenomenon, Complex Fourier series, Fourier series on an arbitrary interval.
[1]: Chapter 6 (Sections 6.6 to 6.9).

Weeks 5 and 6: The Riemann-Lebesgue lemma, Pointwise convergence, uniform convergence, differentiation, and integration of Fourier series; Fourier integrals.
[1]: Chapter 6 (Sections 6.10, 6.11, and 6.13).

Weeks 7 to 9: Fourier transforms, Properties of Fourier transforms, Convolution theorem of the Fourier transform, Fourier transforms of step and impulse functions, Fourier sine and cosine transforms, Convolution properties of Fourier transform.
[1]: Chapter 12 (Sections 12.1 to 12.6, and from Exercises 12.18 [questions 8, and 9]).

Week 10 and 11: Laplace transforms, Properties of Laplace transforms, Convolution theorem of the Laplace transform, Convolution properties of the Laplace transform, Laplace transforms of the Heaviside and Dirac delta functions.
[1]: Chapter 12 (Sections 12.8 to 12.10, and from Exercises 12.18 [question 27]).
[1]: Chapter 11 (Section 11.2 for definition of the Dirac delta function).
[1]: Chapter 12 (Section 12.11 up to Example 12.11.4).

Weeks 12 and 13: Finite Fourier transforms and applications, Applications of Fourier transforms to ordinary differential equations and partial differential equations.
[1]: Chapter 12 (Section 12.15).
[2]: Chapter 2 (Section 2.10, and Section 2.12 [Examples 2.12.1 to 2.12.4, and 2.12.7]).

Weeks 14 and 15: Applications of Laplace transform to ordinary differential equations, partial differential equations, initial and boundary value problems.
[2]: Chapter 4 (Section 4.2 up to Example 4.2.6 [p. 203], and Section 4.3 up to Example 4.3.6 [p. 231]).

Essential Readings

1. Tyn Myint-U & Lokenath Debnath (2007). Linear Partial Differential Equations for Scientists and Engineers (4th ed.). Birkhauser. Indian Reprint.
2. Lokenath Debnath & Dambaru Bhatta (2015). Integral Transforms and Their Applications (3rd ed.). CRC Press Taylor & Francis Group.

DSE-4(iii): Research Methodology (DSE-2(iii) for BA(P), and DSE-4(iii) for B.Sc.)

Weeks 1 and 2: How to learn mathematics; How to write mathematics: Goals of mathematical writing, general principles of mathematical writing, avoiding errors, writing mathematical solutions and proofs, the revision process.
[1]: Chapters 1, and 2.

Weeks 3 to 5: What is mathematical research, finding a research topic, Literature survey, Research Criteria, Format of a research article (including examples of mathematical articles) and a research project (report), Publishing research.
[1]: Chapter 3.
[7]: Chapter 4 (Section 4.1), and Chapter 1.
[8]: Chapters 3, 6, and 8.

Weeks 6 and 7: How to present mathematics: Preparing a mathematical talk, Oral presentation, Poster presentation.
[1]: Chapter 4.
[7]: Chapter 8.
[8]: Chapter 12.
[5]: https://www.d.umn.edu/~jgallian/goodPPtalk.pdf

Weeks 8 to 11: Use of technology which includes LaTeX, PSTricks and Beamer.
[1]: Chapters 9, 10, and 11.
[6]: Chapters 2, 3, and 4.
[10]: https://tug.ctan.org/macros/latex/contrib/beamer/doc/beameruserguide.pdf

Weeks 12 and 13: Web resources- MAA, AMS, SIAM, arXiv, ResearchGate; Journal metrics: Impact factor of journal as per JCR, MCQ, SNIP, SJR, Google Scholar metric; Challenges of journal metrics
[1]: Chapter 7.
[3]: https://en.wikipedia.org/wiki/Journal_ranking#Measures, https://en.wikipedia.org/wiki/Journal_Citation_Reports, https://en.wikipedia.org/wiki/Scopus, https://liu.cwp.libguides.com/c.php?g=45770&p=4417804
[4]: https://academicguides.waldenu.edu/library/journalmetrics#s-lg-box-13497874

Weeks 14 and 15: Reviews/Databases: MathSciNet, zbMath, Web of Science, Scopus; Ethics with respect to science and research, Plagiarism check using software like URKUND/Ouriginal by Turnitin.
[*]: https://mathscinet.ams.org/, https://zbmath.org/, https://mjl.clarivate.com/, https://www.scopus.com/ https://ugccare.unipune.ac.in/, https://www.turnitin.com/products/ouriginal/
[7]: Chapter 7.

Essential Readings:

1. Bindner, Donald, & Erickson Martin (2011). A Student's Guide to the Study, Practice, and Tools of Modern Mathematics. CRC Press, Taylor & Francis Group.
2. Committee on Publication Ethics- COPE (https://publicationethics.org/)
3. Declaration on Research Assessment. https://en.wikipedia.org/wiki/San_Francisco_Declaration_on_Research_Assessment
4. Evaluating Journals using journal metrics; (https://academicguides.waldenu.edu/library/journalmetrics#s-lg-box-13497874)
5. Gallian, Joseph A. (2006). Advice on Giving a Good PowerPoint Presentation (https://www.d.umn.edu/~jgallian/goodPPtalk.pdf). MATH HORIZONS.
6. Lamport, Leslie (2008). LaTeX, a Document Preparation System, Pearson.
7. Locharoenrat, Kitsakorn (2017). Research Methodologies for Beginners, Pan Stanford Publishing Pte. Ltd., Singapore.
8. Nicholas J. Higham. Handbook for writing for the Mathematical Sciences, SIAM, 1998.
9. Steenrod, Norman E., Halmos, Paul R., Schiffer, M. M., & Dieudonné, Jean A. (1973). How to Write Mathematics, American Mathematical Society.
10. Tantau, Till,Wright, Joseph, & Miletić, Vedran (2023). The BEAMER class, Use Guide for Version 3.69. TeX User Group. (https://tug.ctan.org/macros/latex/contrib/beamer/doc/beameruserguide.pdf)
11. University Grants Commission (Promotion of Academic Integrity and Prevention of Plagiarism in Higher Educational Institutions) Regulations 2018 (The Gazette of India:Extraordinary, Part-iii-Sec.4)

Teaching Plan: B.A. (Prog.) with Mathematics as Major, Semester-6

DSC-6: Elementary Mathematical Analysis (DSE-4(i) for B.Sc.)

Weeks 1 to 3: Sequential criterion for limits and continuity of functions, Continuity on intervals, Intermediate value theorem and applications.
[1]: Chapter 4 (Section 4.1 [Definition 4.1.1, Theorem 4.1.9, Corollary 4.1.10, 4.1.11, and Example 4.1.12]).
[1]: Chapter 5 (Section 5.1 [Definition 5.1.1, Theorem 5.1.3, Corollary 5.1.4, Example 5.1.5, and 5.1.11]).
[1]: Chapter 5 (Section 5.3 [page 249 to 252, Corollary 5.3.13]).

Week 4: Uniform continuity.
[1]: Chapter 5 (Section 5.4 [up to page 260, first proof that f(x) = 1/x is *not* uniformly continuous on (0,1)]).

Weeks 5 to 7: Riemann integration, criterion for integrability and examples, Integrability of continuous and monotone functions.
[1]: Chapter 7 (Section 7.2).

Weeks 8 and 9: Algebraic properties of the Riemann integral, Fundamental theorem of calculus (first form).
[1]: Chapter 7 (Section 7.5 [Theorem 7.5.1, 7.5.2, and Corollary 7.5.5], alternative independent proofs using Theorem 7.2.14 may be given from Section 33 of K. A. Ross, Elementary Analysis: Theory of Calculus, Springer).
[1]: Chapter 7 (Section 7.6 [Definition 7.6.1, Theorem 7.6.2, and Remark 7.6.3]).

Weeks 10 and 11: Sequences and series of functions: Pointwise and uniform convergence,
Uniform Cauchy criterion.
[1]: Chapter 9 (pages 544 to 551, all theorems without proofs)

Weeks 12 and 13: Weierstrass M-test, Implications of uniform convergence in calculus.
[1]: Chapter 9 (Theorem 9.2.11 to Corollary 9.2.14, page 553]).
[1]: Chapter 9 (Section 9.3 [pages 557 to 562, all theorems without proofs]).

Weeks 14 and 15: Power series, Radius and interval of convergence, Applications of Abel's theorem for power series.
[1]: Chapter 8 (Section 8.6, all theorems without proofs).

Essential Reading

1. Denlinger, Charles G. (2011). Elements of Real Analysis. Jones & Bartlett India Pvt. Ltd. Student Edition. Reprinted 2015.

Teaching Plan: B.A. (Prog.) /B.Sc. (Physical Sc.) with Mathematics, Semester-6

Discipline A-6: Probability and Statistics

Weeks 1 and 2: Descriptive statistics: Populations, Samples, Stem-and-leaf displays, Dotplots, Histograms, Qualitative data, Measures of location, Measures of variability, Boxplots. [1]: Chapter 1.

Weeks 3 and 4: Sample spaces and events, Probability axioms and properties, Conditional probability, Bayes' theorem and independent events. [1]: Chapter 2.

Weeks 5 and 6: Discrete random variables and probability distributions, Expected values; Probability distributions with their mean and variance: Binomial, geometric, hypergeometric, negative binomial, Poisson, and Poisson distribution as a limit. [1]: Chapter 3.

Weeks 7 and 8: Continuous random variables, Probability density functions, Uniform distribution, Cumulative distribution functions and expected values. [1]: Chapter 4 (Sections 4.1, and 4.2).

Weeks 9 and 10: Normal and standard normal distributions with their percentiles, Approximating the binomial distribution; Exponential distribution, Lognormal distribution.
[1]: Chapter 4 [Sections 4.3, 4.4 (up to Example 4.22 page 172), and 4.5 (Definition page 179 to Example 4.27)].

Weeks 11 and 12: Sampling distribution and standard error of the sample mean, Central Limit Theorem and applications. [1]: Chapter 5 (Section 5.4).

Weeks 13 to 15: Scatterplot of bivariate data, Regression line using principle of least squares (statement with normal equations), Predicted values and the residuals, Error sum of squares, Coefficient of determination, The sample correlation coefficient and properties.
[1]: Chapter 12 [Sections 12.1 (up to Example 12.2), 12.2, and 12.5 (up to page number 529)].

Reference:

1. Devore, Jay L. (2016). *Probability and Statistics for Engineering and the Sciences* (9th ed.). Cengage Learning India Private Limited. Delhi. Indian Reprint 2020.

Practical component - Software labs using Microsoft Excel or any other spreadsheet.

1. Presentation and analysis of data (univariate and bivariate) by frequency tables, descriptive statistics, stem-and-leaf plots, dotplots, histograms, boxplots, comparative boxplots, and probability plots ([1] Section 4.6).
2. Fitting of binomial, Poisson, and normal distributions.
3. Illustrating the Central Limit Theorem through Excel.
4. Fitting of regression line using the principle of least squares.
5. Computation of sample correlation coefficient.

Teaching Plan DSE Courses: B.A. (Prog.) with Mathematics, Semester-6

DSE-2(i): Discrete Dynamical Systems (GE-6(ii) for Generic Elective Courses)

Weeks 1 and 2: Dynamical systems concepts and examples; Some linear models: Bouncing ball, investment Growth (simple and compound interest), population growth, financial (annuity savings and loan payment), economic and linear price models.
[1]: Chapter 1, and Chapter 2: Section 2.1

Weeks 3 and 4: Nonlinear models: Density-dependent population, contagious-disease, economic and nonlinear price models; Some linear systems models: Prey-predator, competing species, Overlapping-generations, and economic systems.
[1]: Chapter 3: Section 3.1, and Chapter 4: Section 4.1

Weeks 5 and 6: Autonomous, non-autonomous linear equations and their solutions, time-series graphs; Homogenous equations and their solutions with applications.
[1]: Chapter 2: Sections 2.2, and 2.3

Weeks 7 and 8: Non-homogenous equations and their solutions with applications; Dynamics of autonomous linear equations, fixed points, stability and oscillation.
[1]: Chapter 2: Sections 2.4 to 2.6

Weeks 9 and 10: Homogeneous, nonhomogeneous linear systems and their dynamics, solution space graphs, fixed points, sinks, sources and saddles.
[1]: Chapter 4: Section 4.2

Week 11: Autonomous nonlinear equations and their dynamics: Exact solutions, fixed points, stability.
[1]: Chapter 3: Section 3.2

Week 12: Cobweb graphs and dynamics: Linearization.
[1]: Chapter 3: Section 3.3

Week 13: Periodic points and cycles: 2-cycles, *m*-cycles, and their stability; Parameterized families.
[1]: Chapter 3: Sections 3.5, and 3.6

Week 14: Bifurcation of fixed points and period-doubling.
[1]: Chapter 3: Section 3.7

Week 15: Characterizations and indicators of chaos.
[1]: Chapter 3: Section 3.8

Essential Reading

1. Marotto, Frederick R. (2006). Introduction to Mathematical Modeling Using Discrete Dynamical Systems. Thomson, Brooks/Cole.

DSE-2(ii): Introduction to Mathematical Modeling

(DSE-4(ii) for B.Sc., and GE-6(i) for Generic Elective Courses)

Weeks 1 and 2: Compartmental diagram and balance law; Exponential decay, radioactive dating, and lake pollution models.
[1]: Chapter 2 (Sections 2.1, 2.2, and 2.5).

Weeks 3 and 4: Case study: Lake Burley Griffin; Drug assimilation into the blood; Case study: Dull, dizzy or dead.
[1]: Chapter 2 (Sections 2.6, 2.7, and 2.8).

Weeks 5 and 6: Exponential growth, Density-dependent growth, Equilibrium solutions and stability of logistic equation, Limited growth with harvesting.
[1]: Chapter 3 (Sections 3.1, 3.2, and 3.3).

Weeks 7 and 8: SIR model for influenza, Predator-prey model.
[1]: Chapter 5 (Sections 5.2, and 5.4).

Weeks 9 and 10: Ecosystem model of competing species, and model of a battle.
[1]: Chapter 5 (Sections 5.7, and 5.9).

Weeks 11 and 12: Fitting models to data graphically; Chebyshev approximation criterion, Least-square criterion: Straight line, parabolic, power curve, transformed least-squares fit, choosing a best model.
[2]: Chapter 3 (Sections 3.1 to 3.4).

Week 13: Monte Carlo simulation modeling**:** Simulating deterministic behavior (area under a curve, volume under a surface).
[2]: Chapter 5 (Section 5.1).

Weeks 14 and 15: Generating random numbers: middle-square method, linear congruence; Simulating probabilistic behavior.
[2]: Chapter 5 (Sections 5.2, and 5.3).

Essential Readings

1. Barnes, Belinda & Fulford, Glenn R. (2015). Mathematical Modelling with Case Studies, Using Maple and MATLAB (3rd ed.). CRC Press, Taylor & Francis Group.
2. Giordano, Frank R., Fox, William P., & Horton, Steven B. (2014). A First Course in Mathematical Modeling (5th ed.). CENGAGE Learning India.

Teaching Plan for Generic Electives, Semester-6

GE-6(iii): Abstract Algebra

Weeks 1 and 2: Modular arithmetic; Definition and examples of groups, Elementary properties of groups.
[1]: Chapter 0 (up to page 7, and Exercises 3, 7, 9 and 11).
[1]: Chapter 2.

Weeks 3 and 4: Order of a group and order of an element of a group; Subgroups and its examples, Subgroup tests; Center of a group and centralizer of an element of a group.
[1]: Chapter 3.

Week 5: Cyclic groups and its properties, Generators of a cyclic group.
[1]: Chapter 4 (up to page 80).

Weeks 6 and 7: Group of symmetries; Permutation groups, Cyclic decomposition of permutations and its properties, Even and odd permutations and the alternating group.
[1]: Chapter 1.
[1]: Chapter 5 (Examples 1 to 9 and illustrations of Theorems 5.1 to 5.7 without proofs).

Weeks 8 and 9: Cosets and Lagrange's theorem; Definition and examples of normal subgroups, Quotient groups.
[1]: Chapter 7 (up to Corollary 5, page 143).
[1]: Chapter 9 (up to Example 11, page 178).

Week 10: Group homomorphisms and properties.
[1]: Chapter 10 (up to Example 14, page 202).

Weeks 11 to 13: Definition, examples and properties of rings, subrings, integral domains, fields, Characteristic of a ring.
[1]: Chapters 12, and 13.

Weeks 14 and 15: Ideals and factor rings; Ring homomorphisms and properties.
[1]: Chapter 14 (up to Example 9, page 251).
[1]: Chapter 15 (Definition and Examples 1 to 7, and properties of ring homomorphisms, up to Corollary 2, page 268).

Essential Reading

1. Gallian, Joseph. A. (2017). Contemporary Abstract Algebra (9th ed.). Cengage Learning India Private Limited, Delhi. Indian Reprint (2021).