Syllabus – Course Work

Recent Advances in Subjects (Chemistry)

Duration – 30 Hours

UNIT I: Emerging Trends in Chemical Sciences

Chapter 1: Evolution of Modern Chemistry

- Development of chemical sciences in the 21st century
- Interdisciplinary nature of chemistry
- Integration of chemistry with physics, biology, and materials science
- Impact of modern technology on chemical research

Chapter 2: Frontier Areas in Chemical Research

- Chemical biology and bio-organic chemistry
- Supramolecular chemistry and molecular recognition
- Energy chemistry and fuel cell technologies
- Photochemistry and solar energy conversion

Chapter 3: Role of Chemistry in Global Challenges

- Climate change and environmental chemistry
- Chemical approaches to energy sustainability
- Chemistry in healthcare and pharmaceuticals
- Role of chemistry in industrial development

UNIT II: Advances in Analytical and Spectroscopic Techniques

Chapter 4: Modern Spectroscopic Methods

- Advances in Nuclear Magnetic Resonance (NMR) spectroscopy
- High-resolution Mass Spectrometry (HRMS)
- Infrared (IR) and Raman spectroscopy developments
- UV–Visible spectroscopy and applications

Chapter 5: Chromatographic Techniques

- High Performance Liquid Chromatography (HPLC)

- Gas Chromatography (GC)
- Ion chromatography and capillary electrophoresis
- Coupled techniques (GC–MS, LC–MS)

Chapter 6: Surface and Structural Analysis

- X-ray diffraction techniques
- Scanning Electron Microscopy (SEM)
- Transmission Electron Microscopy (TEM)
- Atomic Force Microscopy (AFM)

UNIT III: Nano chemistry and Advanced Materials

Chapter 7: Fundamentals of Nanochemistry

- Concept and classification of nanomaterials
- Size-dependent properties of nanoparticles
- Synthesis methods: chemical, physical, and biological

Chapter 8: Characterization of Nanomaterials

- Structural and morphological analysis
- Spectroscopic characterization techniques
- Particle size measurement and surface analysis

Chapter 9: Applications of Nanomaterials

- Nanomaterials in catalysis
- Nanomedicine and drug delivery
- Nanomaterials in electronics and sensors
- Environmental remediation using nanomaterials

UNIT IV: Green Chemistry and Sustainable Chemical Technologies

Chapter 10: Principles of Green Chemistry

- Concept and significance of green chemistry
- The twelve principles of green chemistry
- Environmental impact of chemical processes

Chapter 11: Green Synthetic Methods

- Solvent-free reactions
- Microwave-assisted synthesis
- Biocatalysis and enzymatic reactions
- Use of ionic liquids and supercritical fluids

Chapter 12: Sustainable Chemical Processes

- Waste minimization and recycling
- Renewable resources in chemical production
- Green catalysis and eco-friendly reagents
- Industrial applications of green chemistry

UNIT V: Computational Chemistry and Modern Research Techniques

Chapter 13: Introduction to Computational Chemistry

- Role of computers in chemical research
- Molecular modeling techniques
- Quantum chemical calculations

Chapter 14: Theoretical Methods

- Density Functional Theory (DFT)
- Molecular mechanics and molecular dynamics
- Simulation of chemical reactions

Chapter 15: Modern Research Methodology

- Literature survey and scientific databases
- Research design and hypothesis formulation
- Scientific writing and publication ethics
- Data analysis and interpretation

Syllabus – Course Work

Recent Advances in Subjects (Civil Engineering)

Duration – 30 Hours

Unit 1: Emerging Trends in Civil Engineering (4 Hours)

Chapter 1: Overview of Modern Civil Engineering Developments

- Evolution of civil engineering technologies
- Global infrastructure challenges
- Future directions in infrastructure development

Chapter 2: Interdisciplinary Approaches

- Integration of civil engineering with data science
- Role of artificial intelligence and machine learning
- Research opportunities in civil engineering

Chapter 3: Infrastructure Resilience

- Climate change impacts on infrastructure
- Disaster-resistant infrastructure systems
- Resilience-based design philosophy

Unit 2: Advanced Construction Materials (6 Hours)

Chapter 4: High Performance Construction Materials

- High Performance Concrete (HPC)
- Ultra High Performance Concrete (UHPC)
- Self-Compacting Concrete (SCC)

Chapter 5: Sustainable Materials

- Geopolymer concrete
- Recycled aggregates
- Green cement technologies

Chapter 6: Smart and Functional Materials

- Fiber reinforced composites
- Shape memory alloys
- Nano-materials in construction

Unit 3: Smart Structures and Structural Health Monitoring (5 Hours)

Chapter 7: Smart Structural Systems

- Intelligent infrastructure
- Adaptive and responsive structures
- Smart sensors and actuators

Chapter 8: Structural Health Monitoring

- Sensors for monitoring infrastructure
- Damage detection techniques
- Wireless monitoring systems

Chapter 9: Applications

- Monitoring bridges and buildings
- Earthquake damage assessment
- Life-cycle performance evaluation

Unit 4: Sustainable and Green Infrastructure (5 Hours)

Chapter 10: Green Building Concepts

- Sustainable building design principles
- Energy-efficient buildings
- Green building rating systems

Chapter 11: Sustainable Water Resources

- Smart water management
- Water recycling technologies
- Urban flood management

Chapter 12: Sustainable Urban Development

- Smart cities concept
- Low-impact development techniques

- Urban sustainability strategies

Unit 5: Advanced Geotechnical and Transportation Systems (5 Hours)

Chapter 13: Modern Geotechnical Engineering

- Ground improvement techniques
- Geosynthetics applications
- Soil stabilization technologies

Chapter 14: Advanced Foundation Systems

- Deep foundations and pile technologies
- Offshore foundations
- Machine foundations

Chapter 15: Intelligent Transportation Systems

- Smart traffic management
- Autonomous transport infrastructure
- Sustainable transportation planning

Unit 6: Digital Technologies in Civil Engineering (5 Hours)

Chapter 16: Building Information Modeling (BIM)

- Concepts and applications of BIM
- Digital twin in construction
- Collaborative project management

Chapter 17: Artificial Intelligence and Machine Learning

- AI applications in structural analysis
- Predictive maintenance of infrastructure
- Data-driven construction management

Chapter 18: Automation and Robotics

- Robotics in construction
- 3D printing of buildings
- Drones in surveying and inspection

Suggested References

1. Advanced Civil Engineering Materials – Shan Somayaji
2. Smart Structures: Analysis and Design – A. V. Srinivasan
3. Sustainable Construction: Green Building Design and Delivery – Charles J. Kibert
4. American Society of Civil Engineers Journals
5. Institution of Civil Engineers Research Publications
6. Elsevier Civil Engineering Journals

Syllabus – Course Work

Recent Advances in Subjects (Commerce)

Duration – 30 Hours

Unit I: Emerging Trends in Commerce and Business Environment (6 Hours)

1.1 Evolution of Commerce in the Global Economy

- Transformation from traditional commerce to digital commerce
- Changing role of commerce in economic development
- Emerging paradigms in business research

1.2 Impact of Globalization on Commerce

- Liberalization and globalization policies
- Global value chains and trade integration
- International business opportunities and challenges

1.3 Role of Technology in Commerce

- Digital transformation in business
- Artificial Intelligence and Big Data in commerce
- Financial technologies (FinTech)

1.4 Emerging Research Areas in Commerce

- Behavioral finance
- Data-driven decision making
- Digital entrepreneurship

Unit II: Advances in Accounting and Financial Reporting (6 Hours)

2.1 Contemporary Accounting Framework

- Global accounting standards (IFRS convergence)
- Indian Accounting Standards (Ind AS)

2.2 Corporate Financial Reporting

- Integrated reporting
- Sustainability reporting and ESG disclosures

2.3 Forensic Accounting and Fraud Detection

- Corporate fraud analysis
- Role of forensic auditing

2.4 Accounting Information Systems

- Digital accounting systems
- Blockchain in accounting

Unit III: Contemporary Developments in Financial Markets and Banking (6 Hours)

3.1 Structure of Modern Financial Markets

- Capital markets and derivatives markets
- Financial market innovations

3.2 Banking Sector Reforms

- Digital banking and neo-banking
- Financial inclusion initiatives

3.3 Financial Risk Management

- Credit risk and market risk
- Risk mitigation strategies

3.4 Emerging Financial Instruments

- Cryptocurrency and digital currency
- Green finance and sustainable investments

Unit IV: Digital Marketing and E-Commerce Innovations (6 Hours)

4.1 Digital Marketing Landscape

- Evolution of digital marketing strategies
- Social media marketing

4.2 E-Commerce Business Models

- B2B, B2C, C2C, and D2C models
- Online marketplace platforms

4.3 Consumer Behaviour in Digital Markets

- Online purchase behavior
- Personalization and AI-driven marketing

4.4 Data Analytics in Marketing

- Predictive analytics
- Marketing automation tools

Unit V: Globalization, Corporate Governance and Sustainable Business (6 Hours)

5.1 Corporate Governance Practices

- Governance models and board structures
- Transparency and accountability in organizations

5.2 Business Ethics and Corporate Social Responsibility

- Ethical decision making in business
- CSR policies and practices

5.3 Sustainable Business Models

- Green business practices
- Circular economy

5.4 Future of Commerce

- Sustainable development goals and business
- Innovation-driven commerce

Suggested Readings

Books

1. Contemporary Issues in Commerce and Management – Academic Publications
2. Financial Markets and Institutions – Frederic Mishkin
3. Principles of Marketing – Philip Kotler & Kevin Keller
4. Corporate Governance – Christine Mallin

Journals

- Journal of Commerce and Management
- International Journal of Accounting Research
- Journal of Financial Economics
- Journal of Business Research

Syllabus – Course Work

Recent Advances in Subjects (Computer Engineering)

Duration – 30 Hours

UNIT I: Emerging Trends in Computer Engineering

Chapter 1: Evolution of Modern Computing

1. Development of Computer Engineering in the 21st century
2. Moore's Law and post-Moore computing trends
3. High-performance and parallel computing
4. Green computing and sustainable technologies

Chapter 2: Artificial Intelligence and Machine Learning

1. Fundamentals of Artificial Intelligence
2. Machine Learning techniques and applications
3. Deep Learning and Neural Networks
4. AI applications in healthcare, finance, education, and industry

Chapter 3: Data Science and Big Data Analytics

1. Big Data concepts and architecture
2. Data mining and predictive analytics
3. Real-time data processing
4. Research challenges in big data systems

UNIT II: Advanced Computing Technologies (8 Hours)

Chapter 4: Cloud and Edge Computing

1. Cloud computing models and services
2. Virtualization and containerization
3. Edge and Fog computing
4. Cloud security and resource management

Chapter 5: Internet of Things (IoT)

1. IoT architecture and communication protocols
2. Smart sensors and embedded systems
3. Industrial IoT and smart cities
4. Challenges in IoT security and scalability

Chapter 6: Blockchain and Distributed Systems

1. Fundamentals of Blockchain technology
2. Cryptocurrency and smart contracts
3. Distributed ledger systems
4. Applications of Blockchain in industry and governance

UNIT III: Cybersecurity and Intelligent Systems (7 Hours)

Chapter 7: Cybersecurity and Privacy

1. Network security fundamentals
2. Cryptography and authentication techniques
3. Ethical hacking and cyber forensics
4. Data privacy and cyber laws

Chapter 8: Intelligent Automation and Robotics

1. Robotics and autonomous systems
2. Human-computer interaction
3. Intelligent automation using AI
4. Applications in manufacturing and healthcare

Chapter 9: Quantum Computing and Future Technologies

1. Basics of quantum computing
2. Quantum algorithms and cryptography
3. Neuromorphic computing
4. Future research directions in Computer Engineering

UNIT IV: Research Methodologies and Applications (7 Hours)

Chapter 10: Research Trends and Innovation

1. Current research areas in Computer Engineering
2. Interdisciplinary research opportunities
3. Innovation and technology commercialization
4. Case studies of emerging technologies

Chapter 11: Scientific Writing and Publication Ethics

1. Research paper writing techniques
2. Literature review and citation methods
3. Plagiarism and publication ethics
4. Patent filing and intellectual property rights

Chapter 12: Advanced Applications and Case Studies

1. AI-driven applications
2. Smart healthcare systems
3. Intelligent transportation systems
4. Industry 4.0 and digital transformation

Suggested Practical/Assignments

- Review of recent IEEE/SCI indexed research papers
- Seminar on emerging technologies
- Comparative study of AI/ML tools
- Mini research proposal preparation
- Case study analysis on cybersecurity or IoT applications

Syllabus – Course Work

Recent Advances in Subjects (Computer Science)

Duration – 30 Hours

Unit I: Emerging Trends in Computer Science (5 Hours)

Chapters:

1. Chapter 1.1 – Evolution of Computer Science Research
2. Chapter 1.2 – Modern Trends in Computing Technologies
3. Chapter 1.3 – Quantum Computing: Concepts and Applications
4. Chapter 1.4 – High Performance Computing (HPC)
5. Chapter 1.5 – Green Computing and Sustainable Technologies
6. Chapter 1.6 – Future Research Directions in Computing

Unit II: Artificial Intelligence and Machine Learning (5 Hours)

Chapters:

1. Chapter 2.1 – Introduction to Artificial Intelligence
2. Chapter 2.2 – Intelligent Systems and Expert Systems
3. Chapter 2.3 – Machine Learning Fundamentals: Supervised, Unsupervised, Reinforcement Learning
4. Chapter 2.4 – Deep Learning and Neural Networks
5. Chapter 2.5 – Natural Language Processing (NLP)
6. Chapter 2.6 – AI Applications and Ethical Considerations

Unit III: Big Data Analytics and Data Science (5 Hours)

Chapters:

1. Chapter 3.1 – Introduction to Big Data
2. Chapter 3.2 – Characteristics of Big Data (Volume, Velocity, Variety, Veracity)
3. Chapter 3.3 – Hadoop Ecosystem and MapReduce
4. Chapter 3.4 – Data Mining and Predictive Analytics
5. Chapter 3.5 – Data Visualization Techniques
6. Chapter 3.6 – Applications of Big Data in Industry and Research

Unit IV: Cloud Computing and Distributed Systems (5 Hours)

Chapters:

1. Chapter 4.1 – Fundamentals of Cloud Computing
2. Chapter 4.2 – Cloud Service Models: IaaS, PaaS, SaaS

3. Chapter 4.3 – Virtualization and Cloud Architecture
4. Chapter 4.4 – Distributed Computing Models
5. Chapter 4.5 – Microservices, Containerization, Serverless Architecture
6. Chapter 4.6 – Cloud Security and Data Management

Unit V: Internet of Things (IoT) and Edge Computing (5 Hours)

Chapters:

1. Chapter 5.1 – Fundamentals of IoT
2. Chapter 5.2 – IoT Architecture and Components
3. Chapter 5.3 – Sensors, Embedded Systems, and Communication Protocols
4. Chapter 5.4 – Edge Computing Concepts and Frameworks
5. Chapter 5.5 – Smart Applications: Smart Cities, Smart Homes, Healthcare
6. Chapter 5.6 – Security, Privacy, and Challenges in IoT

Unit VI: Cyber Security and Blockchain Technology (5 Hours)

Chapters:

1. Chapter 6.1 – Cyber Security Concepts and Threats
2. Chapter 6.2 – Network Security and Cryptography Basics
3. Chapter 6.3 – Security Vulnerabilities and Risk Management
4. Chapter 6.4 – Fundamentals of Blockchain Technology
5. Chapter 6.5 – Smart Contracts and Decentralized Systems
6. Chapter 6.6 – Applications of Blockchain and Future Trends in Security

Suggested Readings

1. Stuart Russell & Peter Norvig – Artificial Intelligence: A Modern Approach
2. Ian Goodfellow – Deep Learning
3. Tom White – Hadoop: The Definitive Guide
4. Kai Hwang – Cloud Computing for Machine Learning and Cognitive Applications
5. William Stallings – Cryptography and Network Security
6. Research Papers from **IEEE, ACM, Springer**

Syllabus – Course Work

Recent Advances in Subjects (Dentistry)

Duration – 30 Hours

Unit I: Emerging Trends in Dental Diagnostics (6 Hours)

Chapter 1: Advanced Imaging Technologies

- Cone Beam Computed Tomography (CBCT)
- Digital radiography
- 3D dental imaging techniques
- Optical coherence tomography in dentistry

Chapter 2: Salivary Diagnostics

- Saliva as a diagnostic biomarker
- Detection of systemic diseases through saliva
- Salivary proteomics and genomics

Chapter 3: Laser Technology in Dentistry

- Types of dental lasers
- Applications in oral surgery, periodontics, and endodontics
- Advantages and clinical limitations

Chapter 4: Chairside Diagnostic Technologies

- Caries detection devices
- Digital intraoral scanners
- Fluorescence-based diagnostic tools

Unit II: Advances in Dental Biomaterials & Nanotechnology (6 Hours)

Chapter 1: Evolution of Dental Biomaterials

- Bioactive restorative materials
- Smart dental materials
- Biocompatibility considerations

Chapter 2: Nanotechnology in Dentistry

- Nanocomposites
- Nano-adhesives
- Nanoparticles in restorative dentistry

Chapter 3: Advanced Dental Ceramics

- Zirconia restorations
- Lithium disilicate ceramics
- CAD/CAM ceramic materials

Chapter 4: Tissue Engineering Materials

- Scaffolds for dental tissue regeneration
- Growth factors
- Stem-cell compatible biomaterials

Unit III: Digital Dentistry and Artificial Intelligence (6 Hours)

Chapter 1: Digital Workflow in Dentistry

- Digital impressions
- Computer-aided design and manufacturing (CAD/CAM)
- Virtual treatment planning

Chapter 2: Artificial Intelligence in Dentistry

- AI in dental diagnostics
- Machine learning for radiographic analysis
- AI in orthodontic treatment planning

Chapter 3: 3D Printing in Dentistry

- Applications in prosthodontics
- Surgical guides in implantology
- Custom dental appliances

Chapter 4: Teledentistry

- Remote consultation
- Digital patient monitoring
- Legal and ethical considerations

Unit IV: Regenerative Dentistry and Implantology (6 Hours)

Chapter 1: Stem Cells in Dentistry

- Dental pulp stem cells
- Periodontal ligament stem cells
- Clinical applications

Chapter 2: Regenerative Endodontics

- Pulp regeneration techniques
- Tissue engineering approaches
- Clinical protocols

Chapter 3: Advances in Implant Dentistry

- Surface modifications of implants
- Immediate loading implants
- Digital implant planning

Chapter 4: Platelet-Rich Plasma and Growth Factors

- PRP and PRF in dentistry
- Applications in oral surgery and periodontics

Unit V: Evidence-Based Dentistry and Future Trends (6 Hours)

Chapter 1: Evidence-Based Dental Practice

- Concept of EBD
- Systematic reviews and meta-analysis
- Critical appraisal of dental literature

Chapter 2: Personalized Dentistry

- Genomics in dentistry
- Precision dental care
- Risk assessment models

Chapter 3: Minimally Invasive Dentistry

- Microdentistry
- Preventive and conservative approaches
- Advances in adhesive dentistry

Chapter 4: Future Directions in Dental Research

- Robotics in dentistry
- Bioengineered teeth
- Smart diagnostic tools
- Sustainable dentistry

Suggested Readings

1. **Carranza's Clinical Periodontology** – Newman, Takei, Klokkevold
2. **Sturdevant's Art and Science of Operative Dentistry** – Ritter & Boushell
3. **Contemporary Implant Dentistry** – Carl E. Misch
4. **Digital Dentistry: A Comprehensive Reference** – Hom-Lay Wang
5. Recent articles from journals:
    - Journal of Dental Research
    - Journal of Prosthetic Dentistry
    - International Journal of Oral & Maxillofacial Implants
    - Journal of Clinical Periodontology

Syllabus – Course Work

Recent Advances in Subjects (Drawing & Painting)

Duration – 30 Hours

UNIT I: Contemporary Trends in Drawing & Painting

Chapter 1: Evolution of Contemporary Art Practices

1. Transition from traditional to contemporary art
2. Modernism, postmodernism, and contemporary aesthetics
3. Globalization and changing visual culture

Chapter 2: Emerging Artistic Movements

1. Conceptual art and installation practices
2. Minimalism, abstract expressionism, and neo-expressionism
3. Street art, public art, and socially engaged art

UNIT II: Experimental Techniques and Mixed Media

Chapter 1: Innovations in Drawing Techniques

1. Experimental mark-making and visual narration
2. Mixed drawing media and unconventional surfaces
3. Texture, layering, and material exploration

Chapter 2: Mixed Media and Contemporary Painting

1. Collage, assemblage, and mixed media art
2. Acrylics, inks, industrial colors, and synthetic materials
3. Sustainable and eco-friendly art materials

UNIT III: Digital Art and Technological Interventions

Chapter 1: Digital Transformation in Visual Arts

1. Introduction to digital drawing and painting
2. Graphic tablets, digital tools, and creative software
3. Artificial Intelligence and generative art practices

Chapter 2: Multimedia and Interdisciplinary Art

1. Photography, video art, and projection art
2. Animation and interactive visual experiences

3. Integration of visual arts with design and media studies

UNIT IV: Indian Contemporary Art and Cultural Discourse

Chapter 1: Contemporary Indian Drawing & Painting

1. Major contemporary Indian artists and their contributions
2. Indigenous traditions in modern artistic expression
3. Folk, tribal, and urban visual cultures

Chapter 2: Art, Society, and Identity

1. Gender, identity, and representation in art
2. Political and social dimensions of visual art
3. Art criticism and cultural interpretation

UNIT V: Research Perspectives and Professional Practices

Chapter 1: Research Methodology in Visual Arts

1. Practice-based research in art
2. Documentation, portfolio development, and visual analysis
3. Research writing and presentation in fine arts

Chapter 2: Contemporary Art Market and Professional Development

1. Art galleries, museums, and curatorial practices
2. Art entrepreneurship and creative industries
3. Copyright, intellectual property, and digital ethics in art

Suggested Readings

1. Stangos, Nikos — *Concepts of Modern Art*
2. Lucie-Smith, Edward — *Art Today*
3. Gombrich, E.H. — *The Story of Art*
4. Barrett, Terry — *Criticizing Art*
5. Arnheim, Rudolf — *Art and Visual Perception*
6. Foster, Hal — *The Return of the Real*
7. Paul, Christiane — *Digital Art*
8. Chaitanya Sambrani — *Contemporary Indian Art*
9. John Berger — *Ways of Seeing*
10. Relevant journals, exhibition catalogues, and online art archives.

Syllabus – Course Work

Recent Advances in Subjects (Economics)

Duration – 30 Hours

Unit I: Recent Advances in Microeconomic Theory

Chapter 1: Modern Consumer Theory

- Rational choice theory and its critiques
- Utility maximization and revealed preference
- Intertemporal choice and uncertainty
- Information asymmetry and adverse selection

Chapter 2: Game Theory and Strategic Behaviour

- Nash equilibrium and refinements
- Repeated games and dynamic strategies
- Applications in industrial organization and public policy

Chapter 3: Market Design and Mechanism Design

- Auction theory
- Matching markets
- Incentive compatible mechanisms

Unit II: Recent Developments in Macroeconomics

Chapter 4: New Keynesian Economics

- Price rigidity and wage stickiness
- DSGE models and macroeconomic stabilization
- Monetary policy frameworks

Chapter 5: Financial Frictions and Macroeconomic Stability

- Credit markets and macro fluctuations
- Global financial crises and macroprudential policy
- Role of central banks

Chapter 6: Growth and Innovation

- Endogenous growth theory
- Technology, innovation and productivity

- Human capital and long-run growth

Unit III: Advances in Development Economics

Chapter 7: Poverty and Inequality

- Measurement of poverty and inequality
- Multidimensional poverty index
- Inclusive growth strategies

Chapter 8: Impact Evaluation Methods

- Randomized Controlled Trials (RCTs)
- Natural experiments
- Quasi-experimental research methods

Chapter 9: Institutions and Development

- Governance and institutional quality
- Role of property rights
- Political economy of development

Unit IV: Behavioural and Experimental Economics

Chapter 10: Behavioural Decision Making

- Bounded rationality
- Prospect theory
- Time inconsistency and behavioral biases

Chapter 11: Behavioural Public Economics

- Nudges and policy design
- Behavioural taxation and savings behavior
- Behavioral insights in development policy

Chapter 12: Experimental Economics

- Laboratory experiments
- Field experiments
- Applications in policy evaluation

Unit V: Emerging Areas in Economics

Chapter 13: Environmental and Climate Economics

- Economics of climate change
- Carbon markets and environmental policy
- Sustainable development and green growth

Chapter 14: Digital and Platform Economics

- Economics of digital markets
- Data economy and network effects
- Competition policy in digital platforms

Chapter 15: Big Data and Machine Learning in Economics

- Data-driven economic analysis
- Predictive modelling
- AI and economic forecasting

Suggested Readings

Books

1. Daron Acemoglu – *Introduction to Modern Economic Growth*
2. Angus Deaton – *The Great Escape: Health, Wealth, and the Origins of Inequality*
3. Richard H. Thaler – *Misbehaving: The Making of Behavioral Economics*
4. Abhijit V. Banerjee and Esther Duflo – *Poor Economics*

Syllabus – Course Work

Recent Advances in Subjects (Education)

Duration – 30 Hours

UNIT I: Emerging Paradigms in Education

Chapter 1: Constructivism to Connectivism

* Social constructivism and knowledge co-creation
* Connectivism in digital age
* Communities of practice

Chapter 2: Outcome-Based and Competency-Based Education

* Learning outcomes and assessment alignment
* Competency mapping frameworks
* Graduate attributes and employability

Chapter 3: Multidisciplinary and Holistic Education

* Liberal education models
* Interdisciplinary research trends
* Academic flexibility frameworks

UNIT II: Technology and Digital Transformation

Chapter 4: Artificial Intelligence in Education

* AI-driven personalized learning
* Intelligent Tutoring Systems
* Predictive analytics in student performance

Chapter 5: Online, Blended and Hybrid Learning Models

* MOOCs and open education platforms
* Flipped classrooms
* Micro-credentialing and digital badges

Chapter 6: Learning Analytics and Educational Data Mining

* Big data in education
* Dashboard-based decision making
* Ethical issues in dat use

UNIT III: Contemporary Research Trends and Methodologies (6 Hours)

Chapter 7: Advanced Quantitative Approaches

* Structural Equation Modeling (SEM)
* Multilevel modeling
* Meta-analysis

Chapter 8: Emerging Qualitative and Mixed Methods

* Narrative inquiry
* Phenomenology and grounded theory
* Mixed-methods research designs

Chapter 9: Design-Based and Action Research Innovations

* Design-based research (DBR)
* Practitioner research models
* Translational research in education

UNIT IV: Global Reforms and Policy Innovations

Chapter 10: Internationalization of Higher Education

* Global rankings and benchmarking
* Academic mobility and credit transfer
* Transnational education

Chapter 11: Education for Sustainable Development (ESD)

* SDG 4 framework
* Climate literacy and green campuses
* Global citizenship education

Chapter 12: Policy Reforms and Governance

* Decentralization and autonomy
* Quality assurance mechanisms
* Accreditation reforms

UNIT V: Future Directions and Emerging Areas

Chapter 13: Inclusive and Equitable Education

* Universal Design for Learning (UDL)
* Assistive technologies
* Gender and social equity

Chapter 14: Neuroscience and Education

* Brain-based learning
* Cognitive load theory
* Socio-emotional learning

Chapter 15: Future Skills and 21st-Century Competencies

* Critical thinking and creativity
* Digital literacy
* Lifelong learning ecosystems

Syllabus – Course Work

Recent Advances in Subjects (Electrical Engineering)

Duration – 30 Hours

UNIT I: Modern Power Systems and Smart Grids (6 Hours)

Chapter 1: Evolution of Modern Power Systems

- Conventional vs Modern Power Systems
- Challenges in modern grid operation
- Decentralized power systems

Chapter 2: Smart Grid Architecture

- Smart grid components
- Smart meters and advanced metering infrastructure (AMI)
- Wide area monitoring systems (WAMS)

Chapter 3: Smart Grid Technologies

- Communication infrastructure in smart grids
- Demand side management
- Distributed generation integration

Chapter 4: Cybersecurity in Smart Grids

- Vulnerabilities in power networks
- Protection strategies

UNIT II: Advances in Power Electronics and Drives (6 Hours)

Chapter 1: Advanced Power Semiconductor Devices

- SiC and GaN devices
- Wide bandgap semiconductor technology

Chapter 2: Modern Converter Topologies

- Multilevel inverters
- Matrix converters
- Modular multilevel converters (MMC)

Chapter 3: Advanced Motor Drives

- Sensorless control techniques
- Field-oriented control (FOC)
- Direct torque control (DTC)

Chapter 4: Applications

- Electric vehicle drives
- Renewable energy interfacing

UNIT III: Renewable Energy Systems and Energy Storage (6 Hours)

Chapter 1: Renewable Energy Technologies

- Solar photovoltaic systems
- Wind energy systems
- Hybrid renewable energy systems

Chapter 2: Grid Integration of Renewable Energy

- Power quality issues
- Stability challenges
- Control techniques

Chapter 3: Energy Storage Technologies

- Battery energy storage systems
- Supercapacitors
- Hydrogen energy storage

Chapter 4: Microgrids and Hybrid Systems

- Islanded and grid-connected microgrids
- Energy management systems

UNIT IV: Artificial Intelligence and IoT in Electrical Engineering (6 Hours)

Chapter 1: Artificial Intelligence in Electrical Engineering

- Machine learning techniques
- Neural networks for power system applications

Chapter 2: Applications of AI in Power Systems

- Load forecasting
- Fault detection and diagnosis
- Predictive maintenance

Chapter 3: Internet of Things (IoT) in Electrical Systems

- IoT architecture
- Smart sensors and data acquisition

Chapter 4: Data Analytics and Digital Twin Technology

- Big data in power systems

- Digital twins for power plants and grids

UNIT V: Emerging Technologies in Electrical Engineering (6 Hours)

Chapter 1: Electric Vehicles and Charging Infrastructure

- EV architecture
- Fast charging technologies
- Vehicle-to-grid (V2G)

Chapter 2: High Voltage DC Transmission (HVDC)

- VSC-HVDC systems
- Multi-terminal HVDC networks

Chapter 3: Flexible AC Transmission Systems (FACTS)

- STATCOM, SVC, UPFC
- Power flow control

Chapter 4: Future Research Trends

- Blockchain in energy trading
- Wireless power transfer
- Quantum computing in power systems

Suggested Reference Books

1. A. Keyhani – Smart Power Grid.
2. B. K. Bose – Power Electronics and Motor Drives: Advances and Trends.
3. Ali Keyhani – Design of Smart Power Grid Renewable Energy Systems.
4. Mohammad Shahidehpour – Communication and Control in Electric Power Systems.
5. Selected IEEE Transactions and Journal Papers.

Syllabus – Course Work

Recent Advances in Subjects (English)

Duration – 30 Hours

Unit I: Contemporary Literary Theory (6 Hours)

Chapter 1: Evolution of Modern Literary Theory

- Structuralism and Post-Structuralism
- Deconstruction and its influence on literary criticism
- Reader-response theory

Chapter 2: Postmodernism in Literature

- Characteristics of postmodern literature
- Metafiction and narrative experimentation
- Fragmentation and intertextuality

Chapter 3: New Critical Approaches

- Ecocriticism
- Cognitive literary studies
- Ethical criticism

Unit II: Postcolonial and Global Literature (6 Hours)

Chapter 1: Developments in Postcolonial Theory

- Hybridity, diaspora, and transnational identities
- Subaltern studies
- Decolonizing literary studies

Chapter 2: Globalization and Literature

- World literature concept
- Transnational narratives
- Global literary markets

Chapter 3: Contemporary Postcolonial Writers

- Emerging voices from Africa, Asia, and the Caribbean
- Migration literature
- Global English and literary production

Unit III: Cultural Studies and Identity Discourses (6 Hours)

Chapter 1: Cultural Studies Approaches

- Literature as cultural text
- Media, ideology, and representation
- Popular culture studies

Chapter 2: Gender and Feminist Studies

- Third-wave and fourth-wave feminism
- Gender performativity
- Feminist literary criticism

Chapter 3: Identity Politics in Literature

- Queer theory
- Dalit literature and criticism
- Minority and marginalized voices

Unit IV: Digital Humanities and New Media Studies (6 Hours)

Chapter 1: Introduction to Digital Humanities

- Digital textual analysis
- Corpus linguistics in literary studies
- Digital archives and research

Chapter 2: Literature and Digital Media

- Hypertext narratives
- Electronic literature
- Social media and literary expression

Chapter 3: Technology and Literary Research

- Computational literary analysis
- Digital research tools
- Online scholarly databases

Unit V: Emerging Research Areas in English Studies (6 Hours)

Chapter 1: Ecocriticism and Environmental Humanities

- Climate change and literature
- Environmental narratives
- Literature and sustainability

Chapter 2: Interdisciplinary Literary Studies

- Literature and psychology
- Literature and sociology
- Literature and philosophy

Chapter 3: Future Directions in English Research

- Artificial intelligence and literature
- Global Englishes
- Publishing trends and academic research

Syllabus – Course Work

Recent Advances in Subjects (Geography)

Duration – 30 Hours

Unit I: Emerging Paradigms in Geography

Chapter 1: Evolution of Geographical Thought in the 21st Century

- Transition from classical to modern geography
- Post-positivist approaches
- Critical geography and new theoretical perspectives

Chapter 2: New Paradigms in Geographic Research

- Spatial science and analytical geography
- Behavioural and humanistic geography
- Feminist and postmodern geography

Chapter 3: Big Data and Spatial Thinking

- Role of big data in geographical analysis
- Spatial modelling and predictive analytics
- Open data and participatory mapping

Unit II: Advances in Geospatial Technologies

Chapter 4: Geographic Information Systems (GIS) Innovations

- Advanced GIS modelling
- Spatial decision support systems
- Web GIS and cloud GIS platforms

Chapter 5: Advances in Remote Sensing

- High-resolution satellite imagery
- Hyperspectral remote sensing
- LiDAR technology

Chapter 6: Geospatial Data Science

- Artificial Intelligence in geography
- Machine learning in spatial analysis
- Geospatial big data analytics

Unit III: Recent Developments in Physical Geography

Chapter 7: Climate Change and Earth System Science

- Climate modelling and projections
- Climate variability and extreme events
- Global environmental change

Chapter 8: Advances in Geomorphology

- Digital terrain modelling
- Landscape evolution models
- Remote sensing applications in geomorphology

Chapter 9: Hydrology and Environmental Processes

- Watershed modelling
- Flood risk assessment
- Water resource sustainability

Unit IV: Contemporary Issues in Human Geography

Chapter 10: Urban Geography and Smart Cities

- Urban spatial structure
- Smart city concepts
- Urban sustainability and resilience

Chapter 11: Population and Migration Studies

- Global migration trends
- Demographic transitions
- Refugee and mobility studies

Chapter 12: Economic and Cultural Geography

- Globalization and regional development
- Knowledge economy and innovation geography
- Cultural landscapes and identity

Unit V: Interdisciplinary and Applied Geography

Chapter 13: Environmental Geography and Sustainability

- Sustainable development goals (SDGs)
- Environmental management

- Conservation geography

Chapter 14: Disaster Management and Risk Assessment

- Hazard mapping
- Vulnerability assessment
- Disaster risk reduction strategies

Chapter 15: Applied Geographical Research

- Policy relevance of geographical research
- Community-based geographical studies
- Future directions in geographical research

Suggested Readings

Books

1. Key Concepts in Geography – Nicholas Clifford, Meghan Cope, Shaun French, Gill Valentine.
2. Geographic Information Science and Systems – Paul Longley et al.
3. Introducing Human Geographies – Paul Cloke et al.
4. Remote Sensing and Image Interpretation – Thomas Lillesand et al.
5. The Dictionary of Human Geography – Derek Gregory et al.

Syllabus – Course Work

Recent Advances in Subjects (Hindi)

Duration – 30 Hours

UNIT I: Contemporary Trends in Hindi Literature (6 Hours)

Chapter 1: Post-Independence Developments in Hindi Literature

- Evolution of Hindi literature after independence
- Major literary movements in modern Hindi
- Social and cultural contexts shaping literature

Chapter 2: Contemporary Hindi Fiction

- New narrative techniques in Hindi novels
- Changing themes: identity, migration, gender, urbanization
- Major contemporary novelists and their contribution

Chapter 3: Modern Hindi Poetry

- Experimental trends in contemporary poetry
- Themes of globalization, politics and social transformation
- Major poets and poetic movements

UNIT II: Modern Literary Theories and Hindi Criticism (6 Hours)

Chapter 4: Structuralism and Post-Structuralism

- Structuralist approach to literary texts
- Application in Hindi literary criticism

Chapter 5: Feminist and Dalit Literary Theory

- Feminist discourse in Hindi literature
- Dalit literature and its critical framework
- Representation of marginalized voices

Chapter 6: Postmodernism and Cultural Studies

- Postmodern literary discourse
- Cultural studies and Hindi literature
- Interdisciplinary perspectives in criticism

UNIT III: Recent Developments in Hindi Linguistics (6 Hours)

Chapter 7: Modern Approaches to Hindi Linguistics

- Structural and functional linguistics

- Sociolinguistics in Hindi

Chapter 8: Hindi Language in the Global Context

- Hindi as a global language
- Language policy and linguistic diversity

Chapter 9: Computational Linguistics and Hindi

- Natural Language Processing in Hindi
- Digital corpora and language technology

UNIT IV: Hindi in Media, Translation and Digital Era (6 Hours)

Chapter 10: Hindi Journalism and Media Studies

- Development of Hindi journalism
- Impact of television and digital media

Chapter 11: Translation Studies in Hindi

- Theory and practice of translation
- Hindi translation literature
- Role of translation in cultural exchange

Chapter 12: Digital Literature and Social Media

- Emergence of online literature
- Blogging, web literature and digital storytelling
- Influence of social media on literary expression

UNIT V: Emerging Areas in Hindi Research (6 Hours)

Chapter 13: Interdisciplinary Research in Hindi

- Hindi and cultural studies
- Hindi and sociology
- Hindi and communication studies

Chapter 14: Regional and Folk Literature Studies

- Folk traditions and oral literature
- Preservation of regional dialects and culture

Chapter 15: New Research Methodologies in Hindi

- Digital humanities in Hindi studies
- Textual analysis using digital tools
- Future directions in Hindi research

Suggested Readings

1. नामवर सिंह – *आधुनिक हिन्दी साहित्य की प्रवृत्तियाँ*
2. रामविलास शर्मा – *हिन्दी भाषा और साहित्य*
3. मैनेजर पाण्डेय – *साहित्य के समाजशास्त्र की भूमिका*
4. विश्वनाथ त्रिपाठी – *हिन्दी आलोचना की परम्परा*
5. गणेश देवी – *भाषा और संस्कृति अध्ययन*
6. Contemporary Research Journals on Hindi Literature and Linguistics

Syllabus – Course Work

Recent Advances in Subjects (History)

Duration – 30 Hours

UNIT I: Contemporary Historiography (6 Hours)

Chapter 1: Evolution of Historiography in the 20th and 21st Century

- Transition from traditional to modern historiography
- Impact of postmodernism on historical writing
- Revisionist and counter-histories

Chapter 2: Schools of Historical Thought

- Marxist historiography
- Annales School
- Subaltern Studies

Chapter 3: New Interpretations in Historical Writing

- Microhistory
- Global history
- Comparative history

UNIT II: New Methodological Approaches in History (6 Hours)

Chapter 1: Historical Methodology

- Sources and evidence in modern historical research
- Critical source analysis

Chapter 2: Oral History and Memory Studies

- Oral traditions as historical sources
- Memory and identity in historical narratives

Chapter 3: Quantitative and Scientific Methods

- Statistical analysis in historical research
- Environmental and climate history methods

UNIT III: Interdisciplinary Perspectives (6 Hours)

Chapter 1: History and Social Sciences

- Historical sociology
- Economic history

Chapter 2: History and Cultural Studies

- Cultural history
- History of emotions

Chapter 3: History and Anthropology

- Ethnohistory
- Historical anthropology

UNIT IV: Emerging Themes in Historical Research (6 Hours)

Chapter 1: Gender History

- Feminist historiography
- Women's movements and historical perspectives

Chapter 2: Environmental History

- Human-environment interactions
- Climate change in historical perspective

Chapter 3: Global and Transnational History

- Migration and diaspora studies
- Global networks and exchanges

UNIT V: Digital History and Research Tools (6 Hours)

Chapter 1: Digital Humanities in History

- Concept and scope
- Digital archives and databases

Chapter 2: Technological Tools for Historical Research

- GIS in historical studies
- Data visualization and mapping

Chapter 3: Academic Writing and Publication

- Research paper writing
- Citation styles and plagiarism issues

Suggested Readings

1. Bentley, Jerry H. – *The Oxford Handbook of World History*
2. Burke, Peter – *What is Cultural History?*
3. Tosh, John – *The Pursuit of History*
4. Hunt, Lynn – *Writing History in the Global Era*
5. Iggers, Georg – *Historiography in the Twentieth Century*
6. Ludmilla Jordanova – *History in Practice*

Syllabus – Course Work

Recent Advances in Subjects (Hotel Management)

Duration – 30 Hours

Unit I (5 Hours): Contemporary Theoretical Advances in Tourism

1.1 Evolution of Tourism Theories

- Tourism Area Life Cycle (TALC) – Richard W. Butler
- Experience Economy – Joseph Pine II & James H. Gilmore
- Mobilities Paradigm – John Urry

1.2 Postmodern & Critical Tourism Studies

- Political economy of tourism
- Overtourism and destination resilience
- Degrowth tourism models

1.3 Contemporary Research Trends

- Interdisciplinary research integration
- Bibliometric and scientometric analysis in tourism

Learning Outcome: Develop critical understanding of evolving conceptual frameworks.

Unit II (5 Hours): Digital Transformation & Smart Tourism

2.1 Smart Tourism Ecosystems

- Smart destinations
- IoT-enabled hospitality systems
- Big Data analytics in tourism

2.2 Artificial Intelligence & Automation

- AI in revenue management
- Robotics in hotels
- Chatbots & personalization engines

2.3 Platform Economy & Digital Disruption

- Sharing economy and OTA models
- Case Study: Airbnb
- Case Study: Booking.com

Learning Outcome: Evaluate digital innovations shaping tourism competitiveness.

Unit III (5 Hours): Sustainability, ESG & Responsible Hospitality

3.1 Sustainable Tourism Development

- UN Sustainable Development Goals (SDGs)
- Community-based tourism
- Regenerative tourism

3.2 Climate Change & Tourism

- Carbon-neutral hotels
- Climate risk and adaptation strategies
- ESG reporting frameworks

3.3 Responsible Hospitality Practices

- Circular economy in hotels
- Green certifications
- Case: United Nations World Tourism Organization initiatives

Learning Outcome: Design sustainability-integrated research models.

Unit IV (5 Hours): Consumer Behavior & Experience Economy

4.1 Changing Tourist Behavior

- Post-pandemic travel psychology
- Wellness and medical tourism
- Digital nomadism

4.2 Experience Co-Creation

- Service-dominant logic
- Emotional and transformational tourism

4.3 Branding & Destination Image

- Influencer marketing
- Virtual reality tourism experiences

Learning Outcome: Analyze behavioral shifts and experiential consumption patterns.

Unit V (5 Hours): Strategic Innovation & Business Models in Hotel Management

5.1 Emerging Hotel Business Models

- Asset-light strategies
- Franchise vs management contracts
- Hybrid accommodation models

5.2 Revenue & Yield Management Advances

- Dynamic pricing algorithms
- Predictive analytics

5.3 Global Hospitality Trends

- Case Study: Marriott International
- Case Study: Accor
- Case Study: OYO Rooms

Learning Outcome: Critically assess strategic decision-making in global hotel chains.

Unit VI (5 Hours): Emerging Research Frontiers & Future Directions

6.1 Crisis & Risk Management

- Pandemic recovery models
- Disaster resilience frameworks

6.2 Tourism Policy & Governance

- Public-private partnerships
- Destination competitiveness models

6.3 Research Methodologies in Advanced Tourism Studies

- Mixed-method research
- Longitudinal studies
- Experimental designs
- AI-assisted research methods

6.4 Identifying Research Gaps

- Publishing in high-impact journals
- Proposal development workshop

Learning Outcome: Formulate publishable research proposals in emerging domains.

Suggested Readings

1. Butler, R.W. (1980). The Concept of a Tourism Area Cycle of Evolution.
2. Pine, B.J. & Gilmore, J.H. (1999). *The Experience Economy*.
3. Urry, J. (2007). *Mobilities*.
4. Recent articles from:
    - Tourism Management
    - Annals of Tourism Research
    - International Journal of Hospitality Management
    - Journal of Sustainable Tourism

Syllabus – Course Work

Recent Advances in Subjects (Journalism & Mass Communication)

Duration – 30 Hours

Unit I: Emerging Trends in Journalism & Mass Communication (5 Hours)

Chapters:

1. Chapter 1.1 – Evolution of Journalism in the Digital Era
2. Chapter 1.2 – Transformation from Traditional Media to New Media
3. Chapter 1.3 – Globalization of the Media Industry
4. Chapter 1.4 – Role of Technology in Modern Journalism
5. Chapter 1.5 – Artificial Intelligence in Media
6. Chapter 1.6 – Challenges and Opportunities in Contemporary Media

Unit II: Digital Media and Online Journalism (5 Hours)

Chapters:

1. Chapter 2.1 – Concept and Characteristics of Digital Journalism
2. Chapter 2.2 – Online News Production and Distribution
3. Chapter 2.3 – Mobile Journalism (MOJO)
4. Chapter 2.4 – Data Journalism and Computational Journalism
5. Chapter 2.5 – Multimedia Storytelling Techniques
6. Chapter 2.6 – Audience Engagement and Analytics

Unit III: Social Media and New Media Communication (5 Hours)

Chapters:

1. Chapter 3.1 – Rise of Social Media Platforms in Journalism
2. Chapter 3.2 – Social Media as a News Source
3. Chapter 3.3 – Citizen Journalism
4. Chapter 3.4 – Participatory Media Culture
5. Chapter 3.5 – Social Media Algorithms and News Dissemination
6. Chapter 3.6 – Fake News, Misinformation, and Fact Checking

Unit IV: Media Convergence and Multimedia Journalism (5 Hours)

Chapters:

1. Chapter 4.1 – Concept of Media Convergence

2. Chapter 4.2 – Integration of Print, Broadcast, and Digital Media
3. Chapter 4.3 – Multimedia News Production
4. Chapter 4.4 – Cross-platform Journalism
5. Chapter 4.5 – Podcasting, Video Journalism, and Interactive Media
6. Chapter 4.6 – Impact of Convergence on Media Organizations

Unit V: Media Ethics, Law and Global Communication (5 Hours)

Chapters:

1. Chapter 5.1 – Ethical Issues in Modern Journalism
2. Chapter 5.2 – Media Responsibility and Accountability
3. Chapter 5.3 – Freedom of Press and Regulation
4. Chapter 5.4 – Intellectual Property Rights in Media
5. Chapter 5.5 – Media Laws and Policies
6. Chapter 5.6 – Global Communication and Cultural Impact

Unit VI: Media Research Trends and Future of Journalism (5 Hours)

Chapters:

1. Chapter 6.1 – Emerging Research Areas in Media Studies
2. Chapter 6.2 – Artificial Intelligence and Automation in Journalism
3. Chapter 6.3 – Data-driven Journalism
4. Chapter 6.4 – Media Entrepreneurship and Startups
5. Chapter 6.5 – Future of the News Industry
6. Chapter 6.6 – Digital Transformation of Media Organizations

Suggested Readings

1. Denis McQuail – Mass Communication Theory
2. John Pavlik – Journalism and New Media
3. Stephen Quinn – Digital Journalism
4. Terry Flew – New Media: An Introduction
5. Journals: Journalism Studies, Digital Journalism, Media, Culture & Society
6. Research Papers from **IEEE, Springer, Taylor & Francis**

Syllabus – Course Work

Recent Advances in Subjects (Law)

Duration – 30 Hours

Unit I: Contemporary Developments in Constitutional Law (5 Hours)

Chapter 1: Transformative Constitutionalism

- Evolving interpretation of fundamental rights
- Judicial activism vs. judicial restraint
- Constitutional morality

Chapter 2: Recent Landmark Judgments

- Privacy jurisprudence
- Right to dignity and personal liberty
- Expanding scope of Article 21

Chapter 3: Federalism and Separation of Powers

- Cooperative federalism
- Role of constitutional bodies
- Centre–State relations in recent context

Unit II: Emerging Trends in Criminal Law and Justice System (5 Hours)

Chapter 4: Criminal Law Reforms

- Recent legislative reforms in criminal statutes
- Victim-centric justice approach
- Bail jurisprudence developments

Chapter 5: Cyber Crime and Digital Evidence

- Electronic evidence admissibility
- Forensic advancements
- Challenges in cyber investigation

Chapter 6: Alternative Dispute Resolution in Criminal Justice

- Plea bargaining
- Restorative justice
- Mediation in criminal matters

Unit III: Technology, Artificial Intelligence & Data Protection Laws (5 Hours)

Chapter 7: Data Protection and Privacy Framework

- Evolution of data protection law
- Personal data regulation
- Cross-border data transfer

Chapter 8: Artificial Intelligence and Law

- AI liability issues
- Algorithmic bias and accountability
- Regulation of autonomous systems

Chapter 9: FinTech, Blockchain & Cryptocurrency Regulation

- Legal status of cryptocurrencies
- Smart contracts
- Regulatory challenges

Unit IV: Corporate, Commercial & International Trade Developments (5 Hours)

Chapter 10: Corporate Governance Reforms

- ESG (Environmental, Social, Governance) norms
- Directors' liability and compliance
- Insolvency and bankruptcy trends

Chapter 11: International Trade and Investment Law

- WTO developments
- Bilateral Investment Treaties
- Trade dispute mechanisms

Chapter 12: Competition Law & Digital Markets

- Abuse of dominance in digital platforms
- Anti-competitive practices
- Merger control developments

Unit V: Environmental, Human Rights & Sustainable Development Law (5 Hours)

Chapter 13: Climate Change Litigation

- Environmental constitutionalism
- Public Interest Litigation trends

- Polluter pays principle

Chapter 14: Business and Human Rights

- Corporate accountability
- UN Guiding Principles
- Labour law reforms

Chapter 15: Sustainable Development & SDGs

- Intergenerational equity
- Green governance
- Environmental impact assessments

Unit VI: Research Interface with Emerging Legal Areas (5 Hours)

Chapter 16: Interdisciplinary Legal Research

- Law & Economics
- Law & Technology
- Law & Public Policy

Chapter 17: Comparative Legal Developments

- Global constitutional trends
- Comparative criminal justice reforms
- Transnational legal processes

Chapter 18: Identifying Research Gaps in Emerging Law

- Doctrinal vs empirical research
- Policy impact analysis
- Contemporary research themes for Ph.D. scholars

Suggested Readings

Books

- Recent constitutional law commentaries
- Contemporary criminal law reforms publications
- International trade and corporate law journals

Journals

- Indian Law Review
- Journal of Indian Law Institute
- Harvard Law Review
- Modern Law Review

Syllabus – Course Work

Recent Advances in Subjects (Library Science)

Duration – 30 Hours

UNIT I: Evolution of Libraries in the Digital Era

Chapter 1: From Traditional to Digital Libraries

- Historical evolution of libraries
- Transition from print to digital collections
- Growth of hybrid libraries
- Impact of ICT on library services

Chapter 2: Role of ICT in Library Modernization

- Automation of library operations
- Integrated Library Management Systems (ILMS)
- Cloud-based library systems
- Case studies of modern libraries

Chapter 3: Digital Transformation Strategies

- Digitization techniques and tools
- Digital preservation methods
- Challenges in digital transition

UNIT II: Digital Libraries and Institutional Repositories

Chapter 4: Digital Libraries

- Definition, Features, and Components of Digital Libraries
- Architecture of digital libraries
- Digital library software (DSpace, Greenstone, EPrints)

Chapter 5: Institutional Repositories

- Concept and Importance of Institutional Repositories
- Open Access movement
- Self-archiving and scholarly communication

Chapter 6: Digital Collection Development

- Selection and acquisition of digital resources
- Licensing and copyright issues

- E-books, e-journals, databases

UNIT III: Information Organization & Retrieval Systems

Chapter 7: Metadata Standards

- MARC, Dublin Core, MODS
- Metadata creation and management
- Interoperability Issues in Metadata and Digital Libraries

Chapter 8: Information Retrieval Systems

- Search engines and indexing techniques
- Boolean search, ranking algorithms
- OPAC and Web OPAC Systems in Modern Libraries

Chapter 9: Knowledge Organization

- Classification systems (DDC, UDC, LCC)
- Ontologies and semantic web
- Linked data applications

UNIT IV: Emerging Technologies in Library Science

Chapter 10: Artificial Intelligence in Libraries

- AI-based search systems
- Chatbots and virtual assistants
- Machine learning applications

Chapter 11: Big Data and Data Analytics

- Role of big data in libraries
- Data mining techniques
- User behavior analysis

Chapter 12: Blockchain, IoT, and Cloud Computing

- Blockchain in information security
- IoT-enabled smart libraries
- Cloud-based services

UNIT V: Research Trends, Ethics, and Future Directions

Chapter 13: Research Trends in LIS

- Bibliometrics, scientometrics, informetrics
- Research data management
- Digital scholarship

Chapter 14: Ethics and Legal Issues in Library and Information Science (LIS)

- Copyright and intellectual property rights (IPR)
- Plagiarism and academic integrity
- Data privacy and security

Chapter 15: Future of Libraries

- Smart libraries
- Virtual libraries and metaverse
- Role of LIS professionals in future

UNIT VI: User Services and Knowledge Management

Chapter 16: User-Centered Library Services

- User behavior studies
- Information literacy programs
- Personalized services

Chapter 17: Knowledge Management in Libraries

- Concepts and models
- Knowledge sharing systems
- Role of librarians as knowledge managers

Chapter 18: Marketing of Library Services

- Digital marketing strategies
- Social media in libraries
- Outreach and engagement

Syllabus – Course Work

Recent Advances in Subjects (Life Science)

Duration – 30 Hours

UNIT I: Advances in Molecular Biology and Genetics

Chapter 1: Modern Concepts in Molecular Biology

- Central dogma and its modern interpretation
- DNA replication mechanisms and repair systems
- RNA transcription and post-transcriptional modifications
- Regulation of gene expression in prokaryotes and eukaryotes
- Epigenetic regulation of genes

Chapter 2: Gene Editing and Genetic Engineering

- Recombinant DNA technology
- Gene cloning techniques
- CRISPR-Cas gene editing system
- Gene therapy and applications
- Ethical considerations in genetic manipulation

UNIT II: Recent Developments in Biotechnology

Chapter 3: Agricultural Biotechnology

- Genetically modified crops
- Plant tissue culture and micropropagation
- Molecular markers in crop improvement
- Stress-tolerant crop development
- Applications of biotechnology in food security

Chapter 4: Medical and Pharmaceutical Biotechnology

- Biopharmaceutical production
- Vaccines and monoclonal antibodies

- Stem cell therapy and regenerative medicine
- Nanobiotechnology in medicine
- Personalized medicine and precision therapy

UNIT III: Genomics, Proteomics and Bioinformatics

Chapter 5: Genomics and Functional Genomics

- Genome sequencing technologies
- Next-generation sequencing (NGS)
- Comparative genomics
- Functional genomics and gene function analysis
- Human Genome Project and its significance

Chapter 6: Proteomics and Bioinformatics Tools

- Protein structure and function analysis
- Mass spectrometry in proteomics
- Structural proteomics
- Bioinformatics databases (NCBI, GenBank, PDB)
- Computational tools for biological data analysis

UNIT IV: Advances in Cell Biology and Immunology

Chapter 7: Recent Advances in Cell Biology

- Cell signaling pathways
- Cell cycle regulation and apoptosis
- Stem cells and cell differentiation
- Organelle dynamics and intracellular transport
- Cell imaging and microscopy techniques

Chapter 8: Modern Immunology

- Innate and adaptive immune responses
- Immunological techniques (ELISA, PCR, Flow cytometry)
- Immunotherapy in cancer treatment

- Vaccine development technologies
- Autoimmune diseases and immune disorders

UNIT V: Emerging Trends in Environmental and Applied Life Sciences

Chapter 9: Environmental Biotechnology

- Bioremediation and waste management
- Microbial biotechnology
- Biofertilizers and biopesticides
- Climate change and biodiversity conservation
- Sustainable environmental technologies

Chapter 10: Advances in Applied Life Sciences

- Synthetic biology
- Systems biology
- Metabolomics and metabolite profiling
- Artificial intelligence in biological research
- Future prospects in life science research

Syllabus – Course Work

Recent Advances in Subjects (Management)

Duration – 30 Hours

Unit 1: Evolution of Contemporary Management Thought (5 Hours)

Chapter 1: Paradigm Shifts in Management

- Transition from classical to modern management theories
- Systems thinking and contingency approaches
- Postmodern perspectives in management

Chapter 2: Contemporary Organizational Models

- Network organizations
- Learning organizations
- Agile and adaptive organizations

Chapter 3: Globalization and Management Practices

- Cross-cultural management
- Global leadership competencies
- Managing global virtual teams

Unit 2: Strategic Management in the Digital Era (5 Hours)

Chapter 4: Strategic Thinking and Competitive Advantage

- Dynamic capabilities theory
- Resource-based view (RBV)
- Blue Ocean strategy

Chapter 5: Digital Transformation in Organizations

- Digital business models
- Platform economy
- Industry 4.0 and smart organizations

Chapter 6: Strategic Leadership

- Vision-driven leadership
- Strategic decision-making under uncertainty
- Crisis management and resilience

Unit 3: Innovation, Entrepreneurship and Knowledge Management (5 Hours)

Chapter 7: Innovation Management

- Types of innovation (incremental, radical, disruptive)
- Open innovation models
- Innovation ecosystems

Chapter 8: Entrepreneurship and Start-up Ecosystems

- Entrepreneurial orientation
- Lean startup methodology
- Venture capital and funding mechanisms

Chapter 9: Knowledge Management

- Knowledge creation and sharing
- Organizational learning
- Intellectual capital management

Unit 4: Data Analytics and Artificial Intelligence in Management (5 Hours)

Chapter 10: Business Analytics for Decision Making

- Descriptive, predictive and prescriptive analytics
- Big data applications in management

Chapter 11: Artificial Intelligence in Business

- AI-driven decision support systems
- Automation and robotics in management
- AI applications in marketing, HR and finance

Chapter 12: Digital Ethics and Data Governance

- Data privacy issues
- Cybersecurity management
- Ethical implications of AI

Unit 5: Sustainability, CSR and Ethical Governance (5 Hours)

Chapter 13: Sustainable Business Models

- Triple Bottom Line approach
- Circular economy

Chapter 14: Corporate Social Responsibility

- CSR frameworks and global standards
- Stakeholder theory

Chapter 15: Corporate Governance and Business Ethics

- Governance mechanisms
- Ethical leadership
- Transparency and accountability

Unit 6: Emerging Research Trends in Management (5 Hours)

Chapter 16: Contemporary Research Areas

- Behavioral strategy
- Neuro-management
- Digital leadership

Chapter 17: Interdisciplinary Approaches in Management

- Integration of psychology, economics, sociology, and technology

Chapter 18: Identifying Research Gaps

- Systematic literature review
- Bibliometric analysis
- Developing research questions and conceptual frameworks

Suggested Readings

Core Books

1. Cummings, T., & Worley, C. – Organization Development and Change
2. Dess, G., Lumpkin, G., & Eisner, A. – Strategic Management
3. Nonaka, I., & Takeuchi, H. – The Knowledge-Creating Company
4. Porter, M. – Competitive Strategy

Syllabus – Course Work

Recent Advances in Subjects (Mathematics)

Duration – 30 Hours

UNIT I: Emerging Trends in Pure Mathematics

Chapter 1: Modern Developments in Algebra

- Evolution of algebra in the 21st century
- Abstract algebra in modern mathematical research
- Advances in group theory and ring theory
- Algebraic structures in cryptography
- Applications of algebra in coding theory and information security

Chapter 2: Advances in Topology and Geometry

- Recent developments in algebraic topology
- Differential geometry and manifold theory
- Topological data analysis
- Geometry in theoretical physics
- Applications of topology in computer science

Chapter 3: Functional Analysis and Operator Theory

- Banach and Hilbert spaces
- Operator theory and spectral theory
- Nonlinear functional analysis
- Fixed point theory and applications
- Applications in quantum mechanics and differential equations

UNIT II: Advances in Applied Mathematics and Mathematical Modeling

Chapter 4: Mathematical Modeling and Simulation

- Concept and importance of mathematical modeling
- Modeling techniques in science and engineering
- Deterministic and stochastic models
- Model validation and interpretation
- Case studies in environmental and biological systems

Chapter 5: Nonlinear Dynamics and Chaos Theory

- Introduction to nonlinear systems
- Stability analysis of dynamical systems
- Bifurcation theory
- Chaos and fractals
- Applications in population dynamics and economics

Chapter 6: Differential Equations and Their Modern Applications

- Advances in ordinary and partial differential equations
- Numerical methods for differential equations
- Mathematical models in physics and engineering
- Applications in fluid dynamics and climate modeling

UNIT III: Computational Mathematics and Data Science

Chapter 7: Numerical Methods and Scientific Computing

- Modern numerical techniques
- Numerical linear algebra
- Iterative methods for large systems
- Computational algorithms in mathematics
- Error analysis and stability

Chapter 8: Mathematics in Data Science and Machine Learning

- Role of linear algebra and statistics in data science
- Optimization techniques in machine learning
- Mathematical foundations of artificial intelligence
- Big data analytics and predictive modeling

UNIT IV: Interdisciplinary Applications of Mathematics

Chapter 9: Mathematical Biology and Bioinformatics

- Mathematical models in biological systems
- Population dynamics and epidemiology
- Applications in genetics and bioinformatics
- Disease spread modeling

Chapter 10: Financial Mathematics

- Mathematical models in finance
- Risk analysis and portfolio optimization
- Stochastic processes in finance
- Option pricing models and financial derivatives

Chapter 11: Mathematics in Artificial Intelligence

- Optimization algorithms
- Graph theory in network analysis
- Neural networks and deep learning mathematics
- Applications in automation and robotics

Syllabus – Course Work

Recent Advances in Subjects (Mechanical Engineering)

Duration – 30 Hours

Unit I: Emerging Trends in Mechanical Engineering (6 Hours)

Chapter 1: Overview of Modern Mechanical Engineering

- Evolution of mechanical engineering in the 21st century
- Role of digital technologies in mechanical systems
- Interdisciplinary integration (AI, IoT, materials science)

Chapter 2: Industry 4.0 in Mechanical Engineering

- Cyber-physical systems
- Digital twins
- Smart manufacturing

Chapter 3: Research Trends and Global Innovation

- Emerging research areas
- Research funding trends
- Patent landscapes and technology roadmaps

Chapter 4: Literature Review & Research Gap Identification

- Research databases (Scopus, Web of Science)
- Bibliometric analysis
- Identifying emerging research topics

Unit II: Advanced Manufacturing Technologies (6 Hours)

Chapter 1: Additive Manufacturing

- Principles of additive manufacturing
- 3D printing techniques
- Metal additive manufacturing

Chapter 2: Hybrid Manufacturing Systems

- Integration of additive and subtractive manufacturing
- Smart CNC machining

Chapter 3: Micro and Nano Manufacturing

- Micro-machining techniques
- MEMS fabrication

Chapter 4: Smart Manufacturing Systems

- Sensors in manufacturing
- Data-driven production optimization

Unit III: Computational & Intelligent Mechanical Systems (6 Hours)

Chapter 1: Computational Mechanics

- Finite Element Method (FEM) advances
- Multiphysics simulation

Chapter 2: Artificial Intelligence in Mechanical Engineering

- Machine learning for predictive maintenance
- AI-based design optimization

Chapter 3: Digital Engineering Tools

- CAD/CAE integration
- Simulation-driven design

Chapter 4: Robotics and Autonomous Systems

- Industrial robotics
- Collaborative robots (Cobots)

Unit IV: Advanced Materials & Smart Systems (6 Hours)

Chapter 1: Advanced Engineering Materials

- Nanomaterials
- Composite materials

Chapter 2: Smart Materials

- Shape memory alloys
- Piezoelectric materials

Chapter 3: Functional Materials

- Self-healing materials
- Adaptive structures

Chapter 4: Materials Characterization Techniques

- Electron microscopy
- X-ray diffraction

Unit V: Sustainable Energy & Future Mechanical Systems (6 Hours)

Chapter 1: Renewable Energy Technologies

- Solar thermal systems
- Wind energy systems

Chapter 2: Hydrogen Energy Systems

- Hydrogen production
- Fuel cells

Chapter 3: Sustainable Thermal Systems

- Waste heat recovery
- Energy efficiency in mechanical systems

Chapter 4: Future Transportation Technologies

- Electric vehicles
- Hybrid propulsion systems

Suggested Reference Books

1. Advanced Manufacturing Technologies – I. Gibson
2. Smart Materials and Structures – M. V. Gandhi
3. Additive Manufacturing Technologies – Ian Gibson, David Rosen
4. Computational Methods for Engineers – Steven Chapra
5. Renewable Energy Engineering – John Twidell

Syllabus – Course Work

Recent Advances in Subjects (Pharmacy)

Duration – 30 Hours

UNIT I: Advances in Drug Discovery and Development (6 Hours)

1.1 Modern Approaches in Drug Discovery

- High Throughput Screening (HTS)
- Computer Aided Drug Design (CADD)
- Structure-based drug design
- Artificial Intelligence and Machine Learning in drug discovery

1.2 Target Identification and Validation

- Genomic and proteomic approaches
- Biomarkers in drug discovery
- Systems biology approaches

1.3 Advances in Pharmacokinetics and Pharmacodynamics

- Modeling and simulation techniques
- Physiologically Based Pharmacokinetic Modeling (PBPK)

1.4 Translational Research

- Preclinical to clinical drug development
- Personalized medicine concepts

UNIT II: Novel Drug Delivery Systems (NDDS) (6 Hours)

2.1 Controlled and Targeted Drug Delivery

- Sustained and controlled release formulations
- Site-specific drug delivery systems

2.2 Advanced Drug Delivery Systems

- Liposomes
- Microspheres and microcapsules
- Dendrimers

2.3 Transdermal and Pulmonary Drug Delivery

- Transdermal patches
- Microneedle technology
- Inhalation drug delivery systems

2.4 Smart Drug Delivery Systems

- Stimuli-responsive delivery systems
- pH-sensitive and temperature-sensitive systems

UNIT III: Pharmaceutical Biotechnology and Genomics (6 Hours)

3.1 Biopharmaceuticals

- Recombinant proteins
- Monoclonal antibodies
- Therapeutic enzymes

3.2 Gene Therapy

- Viral and non-viral gene delivery systems
- CRISPR gene editing technology

3.3 Pharmacogenomics

- Role in personalized medicine
- Genetic variations affecting drug response

3.4 Biosimilars and Biobetters

- Development and regulatory challenges
- Manufacturing considerations

UNIT IV: Nanotechnology and Advanced Therapeutics (6 Hours)

4.1 Nanotechnology in Drug Delivery

- Polymeric nanoparticles
- Solid lipid nanoparticles
- Nanoemulsions

4.2 Nanomedicine Applications

- Cancer therapy
- Targeted drug delivery

4.3 Advanced Therapeutic Systems

- Immunotherapy
- RNA-based therapeutics
- Cell-based therapies

4.4 Nanotoxicology

- Safety issues of nanomedicine
- Risk assessment

UNIT V: Recent Advances in Pharmaceutical Research and Regulatory Science (6 Hours)

5.1 Advanced Analytical Techniques

- LC-MS/MS
- HPLC and UPLC
- Spectroscopic techniques in drug analysis

5.2 Quality by Design (QbD)

- Concept and application
- Design space and risk assessment

5.3 Regulatory Affairs in Pharmaceutical Research

- Global regulatory agencies
- Clinical trial regulations
- Good Manufacturing Practices (GMP)

5.4 Current Trends in Pharmaceutical Research

- Artificial intelligence in pharmacy
- Digital health and telepharmacy
- Green pharmacy and sustainable drug development

Suggested Reading / References

1. **Remington: The Science and Practice of Pharmacy**
2. **Drug Delivery Systems – Vyas & Khar**
3. **Novel Drug Delivery Systems – Y.W. Chien**
4. **Pharmaceutical Biotechnology – Crommelin & Sindelar**
5. Research articles from journals such as:
    - *International Journal of Pharmaceutics*
    - *Journal of Controlled Release*
    - *Advanced Drug Delivery Reviews*
    - *Nature Reviews Drug Discovery*

Syllabus – Course Work

Recent Advances in Subjects (Physical Education)

Duration – 30 Hours

UNIT I: Contemporary Trends in Physical Education

Chapter 1: Concept and Evolution of Physical Education

- Changing concept of Physical Education
- Physical Education as an interdisciplinary field
- Integration with health sciences and sports sciences

Chapter 2: Global Trends in Physical Education

- Physical literacy movement
- Fitness and wellness education
- Inclusive and adaptive physical education

Chapter 3: Curriculum Innovations

- Outcome-based physical education curriculum
- Competency-based sports education
- Integrated sports education models

Chapter 4: Professional Development

- Role of Physical Education professionals
- Ethics and professionalism in sports
- Career opportunities in sports science

UNIT II: Advances in Sports Sciences

Chapter 5: Advances in Exercise Physiology

- High-intensity interval training (HIIT)
- Recovery science and fatigue management
- Aerobic and anaerobic performance enhancement

Chapter 6: Advances in Sports Biomechanics

- Motion analysis and movement efficiency
- Injury prevention through biomechanical analysis
- Biomechanical evaluation of sports techniques

Chapter 7: Advances in Sports Psychology

- Mental toughness and performance psychology
- Psychological preparation for elite athletes
- Stress and anxiety management in sports

Chapter 8: Advances in Sports Nutrition

- Nutritional strategies for athletes
- Supplements and ergogenic aids
- Hydration and performance

UNIT III: Technology and Innovation in Sports

Chapter 9: Technology in Sports Training

- Wearable fitness technology
- Smart equipment and sensors
- GPS and performance tracking

Chapter 10: Sports Analytics and Data Science

- Data-based performance analysis
- Video analysis in sports
- Artificial intelligence in coaching

Chapter 11: E-learning and Digital Platforms

- Online coaching systems
- Virtual reality in sports training
- Mobile apps in fitness education

Chapter 12: Sports Equipment Innovation

- Advanced materials in sports equipment
- Biomechanically designed gear
- Safety equipment and injury prevention

UNIT IV: Emerging Research Areas and Global Perspectives

Chapter 13: Sports Medicine and Rehabilitation

- Injury management and rehabilitation
- Physiotherapy in sports
- Prevention strategies

Chapter 14: Physical Activity and Public Health

- Physical inactivity and lifestyle diseases
- Role of physical activity in disease prevention
- Community health and fitness programs

Chapter 15: Talent Identification and Athlete Development

- Scientific talent identification
- Long-term athlete development model
- Youth sports development

Chapter 16: Future Directions in Physical Education

- Artificial intelligence in sports training
- Genetic research in sports performance
- Sustainable sports development
- Global policies in physical education

Suggested Readings

1. Bompa, T. & Buzzichelli, C. – *Periodization: Theory and Methodology of Training*.
2. McArdle, W., Katch, F., & Katch, V. – *Exercise Physiology*.
3. Weinberg, R. & Gould, D. – *Foundations of Sport and Exercise Psychology*.
4. Baechle, T. & Earle, R. – *Essentials of Strength Training and Conditioning*.
5. ACSM – *ACSM's Guidelines for Exercise Testing and Prescription*.
6. Journal of Sports Sciences.
7. International Journal of Physical Education and Sports Science.

Syllabus – Course Work

Recent Advances in Subjects (Physics)

Duration – 30 Hours

Unit 1: Advances in Quantum Physics (6 Hours)

Chapter 1: Foundations of Modern Quantum Theory

- Review of quantum mechanics principles
- Quantum superposition and entanglement
- Bell's inequalities and experimental tests

Chapter 2: Quantum Information Science

- Qubits and quantum gates
- Quantum algorithms (Shor's algorithm, Grover's algorithm)
- Quantum cryptography and teleportation

Chapter 3: Quantum Simulation

- Ultracold atoms and optical lattices
- Simulation of condensed matter systems
- Applications in many-body physics

Unit 2: Nanoscience and Advanced Materials (6 Hours)

Chapter 4: Nanomaterials

- Carbon nanotubes
- Graphene and 2D materials
- Quantum dots and nanowires

Chapter 5: Topological Materials

- Topological insulators
- Quantum Hall effect and topological phases
- Spintronics and applications

Chapter 6: Characterization Techniques

- Scanning tunneling microscopy (STM)
- Atomic force microscopy (AFM)
- Electron microscopy in nanoscience

Unit 3: Particle Physics and Cosmology (6 Hours)

Chapter 7: Standard Model of Particle Physics

- Fundamental particles and interactions
- Gauge theories
- Higgs mechanism and Higgs boson discovery

Chapter 8: Beyond the Standard Model

- Super symmetry
- Dark matter candidates
- Grand unified theories

Chapter 9: Modern Cosmology

- Big Bang theory
- Cosmic microwave background radiation
- Dark energy and accelerating universe

Unit 4: Quantum Technologies and Photonics (6 Hours)

Chapter 10: Quantum Computing

- Physical implementations of qubits
- Superconducting qubits
- Ion trap quantum computers

Chapter 11: Photonics and Laser Physics

- Ultrafast lasers
- Photonic crystals
- Integrated photonics

Chapter 12: Quantum Sensors

- Atomic clocks
- Magnetometers
- Precision measurements

Unit 5: Emerging Interdisciplinary Areas (6 Hours)

Chapter 13: Gravitational Wave Physics

- General relativity basics
- Detection techniques
- Impact on astrophysics

Chapter 14: Plasma Physics and Fusion Energy

- Magnetic confinement
- Tokamak and stellarator devices
- Fusion research

Chapter 15: Computational Physics and Artificial Intelligence

- High-performance computing in physics
- Machine learning applications
- Data-driven physics research

Suggested References

1. Steven Weinberg – *Lectures on Quantum Mechanics*
2. Richard Feynman – *The Feynman Lectures on Physics*
3. Mark Fox – *Quantum Optics: An Introduction*
4. Charles Kittel – *Introduction to Solid State Physics*
5. Research articles from journals such as:
    - *Nature Physics*
    - *Physical Review Letters*
    - *Science*

Syllabus – Course Work

Recent Advances in Subjects (Political Science)

Duration – 30 Hours

UNIT I: Contemporary Political Theory

Chapter 1: Postmodernism and Political Theory

- Concept of postmodernism
- Critique of universal truths
- Thinkers like Michel Foucault and Jacques Derrida
- Power, discourse, and deconstruction

Chapter 2: Feminist Political Theory

- Concept, Origins, and Waves of Feminism
- Gender justice and equality
- Intersectionality
- Contributions of Simone de Beauvoir

Chapter 3: Environmental Political Theory

- Political ecology
- Climate justice
- Sustainable development
- Global environmental governance

UNIT II: Global Politics and Governance

Chapter 4: Globalization and Its Impact

- Concept and Dimensions of Globalization (Economic, Political, and Cultural Globalization)
- Role of multinational corporations (MNCs) in Globalization
- Global Inequalities – Structures, Causes, and Consequences

Chapter 5: International Organizations and Governance

- Role of United Nations
- World Trade Organization and global trade regulation
- Global governance mechanisms

Chapter 6: Geopolitics and Emerging Powers

- Rise of China and India
- Multipolar world order

- Regional conflicts and diplomacy

UNIT III: Advanced Research Methods in Political Science

Chapter 7: Quantitative Research Techniques

- Statistical analysis
- Survey methods
- Big data in political research

Chapter 8: Qualitative Research Methods

- Case study approach
- Ethnography
- Discourse analysis

Chapter 9: Mixed Methods and Digital Research

- Combining qualitative and quantitative methods
- Digital tools in political research
- Data visualization techniques

UNIT IV: Public Policy and Governance Innovations

Chapter 10: Public Policy Analysis

- Policy formulation and evaluation
- Evidence-based policymaking
- Role of think tanks

Chapter 11: E-Governance and Digital Democracy

- Digital governance tools
- Transparency and accountability
- Role of technology in elections

Chapter 12: Governance Reforms and Public Administration

- New Public Management (NPM)
- Good governance principles
- Decentralization

UNIT V: Ethics, Power, and Future Directions

Chapter 13: Political Ethics and Accountability

- Ethics in public office
- Corruption and anti-corruption measures

- Transparency and integrity

Chapter 14: Power, Media, and Politics

- Role of media in shaping political opinion
- Fake news and misinformation
- Political communication strategies

Chapter 15: Future Trends in Political Science

- Artificial Intelligence in politics
- Global challenges (climate change, migration)
- Interdisciplinary research approaches

Syllabus – Course Work

Recent Advances in Subjects (Psychology)

Duration – 30 Hours

UNIT I: Contemporary Trends in Psychology

Chapter 1: Evolution of Modern Psychology

1. Transition from classical to contemporary psychology
2. Major paradigms in 21st-century psychology
3. Integration of psychology with neuroscience and behavioral sciences

Chapter 2: Positive Psychology and Well-being

1. Concepts of happiness, resilience, and flourishing
2. Emotional intelligence and life satisfaction
3. Applications of positive psychology in education and organizations

Chapter 3: Cultural and Indigenous Psychology

1. Cross-cultural perspectives in psychology
2. Indigenous approaches to mental health
3. Cultural influences on behavior and cognition

UNIT II: Advances in Cognitive and Neuroscience Research

Chapter 1: Cognitive Psychology and Information Processing

1. Attention, perception, and memory models
2. Decision-making and problem-solving processes
3. Artificial intelligence and cognitive simulation

Chapter 2: Neuropsychology and Brain Imaging

1. Brain-behavior relationship
2. Functional MRI, EEG, and neuroimaging techniques
3. Neuroplasticity and cognitive rehabilitation

Chapter 3: Cognitive Neuroscience Applications

1. Psychology of learning and memory enhancement

2. Neuropsychological disorders
3. Brain-based interventions and therapies

UNIT III: Emerging Areas in Clinical and Health Psychology

Chapter 1: Recent Trends in Clinical Psychology

1. Evidence-based psychotherapy
2. Cognitive Behavioral Therapy (CBT)
3. Third-wave therapies: ACT, DBT, and mindfulness-based interventions

Chapter 2: Health Psychology and Behavioral Medicine

1. Stress, coping, and psychosomatic disorders
2. Lifestyle diseases and psychological interventions
3. Mental health promotion and preventive strategies

Chapter 3: Digital and Tele-Psychology

1. Online counseling and psychotherapy
2. Mobile mental health applications
3. Ethical and legal concerns in tele-mental health services

UNIT IV: Social, Organizational, and Applied Psychology

Chapter 1: Advances in Social Psychology

1. Social cognition and attribution theories
2. Social media psychology and cyber behavior
3. Group dynamics and interpersonal relationships

Chapter 2: Organizational and Industrial Psychology

1. Workplace motivation and leadership
2. Employee well-being and work-life balance
3. Organizational behavior in digital workplaces

Chapter 3: Psychology in Education and Society

1. Inclusive education and psychological support
2. Learning disabilities and intervention strategies
3. Community psychology and social empowerment

UNIT V: Research Innovations and Ethical Issues in Psychology

Chapter 1: Modern Research Methods in Psychology

1. Quantitative and qualitative approaches
2. Mixed-method research designs
3. Big data and analytics in psychological research

Chapter 2: Technological Innovations in Psychological Research

1. Artificial intelligence and machine learning in psychology
2. Virtual reality and simulation studies
3. Psychological assessment through digital tools

Chapter 3: Ethics and Future Directions

1. Ethical issues in psychological research
2. Data privacy and confidentiality
3. Future scope and challenges in psychology

Suggested Readings

1. Baron, R. A. & Branscombe, N. R. *Social Psychology*.
2. Ciccarelli, S. & White, J. *Psychology*.
3. Gazzaniga, M. *Cognitive Neuroscience*.
4. Snyder, C. R. & Lopez, S. *Positive Psychology*.
5. American Psychological Association Publications (Recent Editions).
6. Journal of Applied Psychology.
7. Indian Journal of Psychology and Psychological Medicine.
8. Recent peer-reviewed research articles and reports.

Syllabus – Course Work

Recent Advances in Subjects (Public Administration)

Duration – 30 Hours

Unit I: Changing Paradigms in Public Administration (6 Hours)

Unit Chapter 1: Evolution of Administrative Thought

- From Classical Administration to New Public Administration
- Influence of Woodrow Wilson and administrative politics debate
- Bureaucratic model and reforms

Unit Chapter 2: New Public Management

- Market-oriented administration
- Performance management and accountability
- Public sector efficiency

Unit Chapter 3: Post-NPM Approaches

- Digital-era governance
- Whole-of-government approach
- Neo-Weberian state

Unit II: Governance and Public Policy Innovations (6 Hours)

Unit Chapter 4: Concept of Governance

- Governance vs Government
- Good governance principles
- Global governance frameworks

Unit Chapter 5: Evidence-Based Public Policy

- Policy analysis techniques
- Data-driven governance
- Policy evaluation methods

Unit Chapter 6: Administrative Reforms

- Public sector reforms in developing countries
- Institutional restructuring
- Performance-based administration

Unit III: Digital Governance and Administrative Technology (6 Hours)

Unit Chapter 7: E-Governance and Digital Transformation

- Concepts of e-governance
- Digital service delivery models
- ICT in public administration

Unit Chapter 8: Artificial Intelligence and Public Administration

- AI-based policy analysis
- Algorithmic governance
- Data governance and ethics

Unit Chapter 9: Smart Government

- Smart cities and digital administration
- Open data initiatives
- Cyber governance

Unit IV: Collaborative, Network and Participatory Governance (6 Hours)

Unit Chapter 10: Network Governance

- Inter-organizational collaboration
- Public-private partnerships
- Multi-level governance

Unit Chapter 11: Participatory Governance

- Citizen participation in administration
- Community governance models
- Social accountability mechanisms

Unit Chapter 12: Co-production of Public Services

- Role of civil society
- Citizen engagement in service delivery
- Collaborative public management

Unit V: Emerging Issues and Future Directions (6 Hours)

Unit Chapter 13: Sustainable Development and Administration

- Administrative role in sustainable development
- Governance for climate change
- Sustainable public policies

Unit Chapter 14: Ethics, Transparency and Accountability

- Administrative ethics
- Anti-corruption mechanisms
- Transparency frameworks

Unit Chapter 15: Future of Public Administration Research

- Big data and governance research
- Interdisciplinary administrative studies
- Emerging research methodologies

Suggested Readings

1. Christopher Hood – The Art of the State: Culture, Rhetoric and Public Management
2. Robert B. Denhardt – The New Public Service
3. Mark Moore – Creating Public Value
4. Jan Kooiman – Governance and Public Administration
5. David Osborne and Ted Gaebler – Reinventing Government
6. United Nations – Reports on E-Governance and Public Administration

Syllabus – Course Work

Recent Advances in Subjects (Social Work)

Duration – 30 Hours

UNIT I: Contemporary Theoretical Developments

Chapter 1: Postmodern and Critical Social Work

- Foundations of Postmodernism in social work
- Narrative and solution-focused approaches
- Power, discourse, and knowledge in Social Work
- Influence of thinkers like Michel Foucault on Social Work

Chapter 2: Anti-Oppressive and Anti-Discriminatory Practice

- Theoretical Foundations and Structural inequalities
- Intersectionality theory (influence of Kimberlé Crenshaw)
- Feminist and Dalit perspectives in Indian social work

Chapter 3: Decolonizing Social Work

- Indigenous knowledge systems
- Global South perspectives
- Critique of Western dominance in theory building

UNIT II: Digitalization and Technological Innovations in Social Work

Chapter 4: Digital Social Work

- Tele-social work and e-counseling
- Online case management systems
- Ethical challenges in digital practice

Chapter 5: Artificial Intelligence and Data in Social Services

- Predictive analytics in child protection
- Big data and social policy planning
- Algorithmic bias and accountability

Chapter 6: Cyber Social Work and Online Communities

- Social media activism
- Digital mental health platforms
- Data privacy laws and professional boundaries

UNIT III: Emerging Practice Areas and Global Challenges

Chapter 7: Climate Change and Environmental Social Work

- Green social work
- Disaster management frameworks
- Environmental justice

Chapter 8: Migration, Refugees and Statelessness

- Global migration governance
- Human rights framework
- Role of agencies like United Nations High Commissioner for Refugees

Chapter 9: Mental Health and Trauma-Informed Care

- Community-based mental health
- Trauma-informed practice
- Public health-social work integration

UNIT IV: Recent Advances in Social Work Research Methodology

Chapter 10: Mixed Methods and Advanced Research Designs

- Sequential and concurrent models
- Pragmatic paradigm
- Community-based participatory research

Chapter 11: Digital and Computational Research Methods

- Social network analysis
- Use of AI tools in qualitative coding
- Digital ethnography

Chapter 12: Evidence-Based Practice and Impact Evaluation

- Systematic reviews and meta-analysis
- Randomized Controlled Trials (RCTs) in Social Interventions
- Policy impact assessment

UNIT V: Policy, Ethics, and Future Directions

Chapter 13: Global Social Policy Trends

- Sustainable Development Goals (SDGs)
- Welfare state transformations
- Neoliberalism and privatization

Chapter 14: Advanced Professional Ethics

- Foundations of Professional Ethics and Digital Ethics
- Research integrity and plagiarism
- Ethical dilemmas in crisis intervention

Chapter 15: Future of Social Work Education and Practice

- Interdisciplinary collaborations
- Transnational social work
- Leadership and advocacy in 21st century

Syllabus – Course Work

Recent Advances in Subjects (Yoga)

Duration – 30 Hours

Unit I: Evolution of Modern Yoga Research (6 Hours)

Chapter 1: Historical Development of Yoga Research

- Transition from traditional to scientific yoga studies
- Early yoga research institutions
- Milestones in modern yoga research

Chapter 2: Interdisciplinary Approach to Yoga

- Integration with medicine, psychology, and neuroscience
- Yoga in integrative and complementary medicine

Chapter 3: Evidence-Based Yoga

- Concept of evidence-based practice
- Types of research studies in yoga (clinical trials, meta-analysis, systematic review)

Unit II: Advances in Yoga and Health Sciences (8 Hours)

Chapter 4: Yoga and Physical Health

- Yoga in lifestyle disorders
- Yoga for cardiovascular health
- Yoga in metabolic syndrome and obesity

Chapter 5: Yoga and Mental Health

- Yoga interventions in anxiety and depression
- Yoga and stress management
- Yoga and emotional regulation

Chapter 6: Yoga Therapy and Clinical Applications

- Yoga therapy protocols
- Yoga in rehabilitation and chronic disease management
- Role of yoga in preventive healthcare

Unit III: Technological and Neuroscientific Advances in Yoga (6 Hours)

Chapter 7: Neuroscience of Yoga

- Brain mechanisms during meditation and pranayama
- Neuroplasticity and yogic practices

Chapter 8: Biofeedback and Physiological Monitoring

- Heart rate variability studies
- EEG and fMRI in yoga research

Chapter 9: Digital and Technological Innovations

- Mobile applications for yoga practice
- Wearable technology in yoga research
- Artificial intelligence and yoga training

Unit IV: Emerging Trends and Applications of Yoga (6 Hours)

Chapter 10: Yoga in Education

- Yoga for cognitive enhancement
- Yoga in school and higher education curriculum

Chapter 11: Yoga in Workplace and Community Health

- Corporate yoga programs
- Yoga for occupational stress management

Chapter 12: Globalization of Yoga

- International yoga movement
- Policy initiatives and global recognition of yoga

Unit V: Future Directions and Research Opportunities (4 Hours)

Chapter 13: New Research Frontiers in Yoga

- Genomics and yoga
- Yoga and epigenetics
- Personalized yoga therapy

Chapter 14: Research Ethics and Quality in Yoga Studies

- Ethical considerations in human studies
- Standardization of yoga protocols

Chapter 15: Identifying Research Gaps

- Emerging areas for doctoral research
- Formulation of innovative research proposals

Suggested Readings

Books

1. Feuerstein, Georg. *The Yoga Tradition*.
2. Iyengar, B.K.S. *Light on Yoga*.
3. Brown, Richard & Gerbarg, Patricia. *The Healing Power of the Breath*.
4. Khalsa, Sat Bir. *The Principles and Practice of Yoga in Health Care*.
5. Telles, Shirley et al. *Research-Based Perspectives on the Psychophysiology of Yoga*.

Journals

- International Journal of Yoga
- Journal of Alternative and Complementary Medicine
- Yoga Mimamsa
- Frontiers in Psychology (Yoga Research)